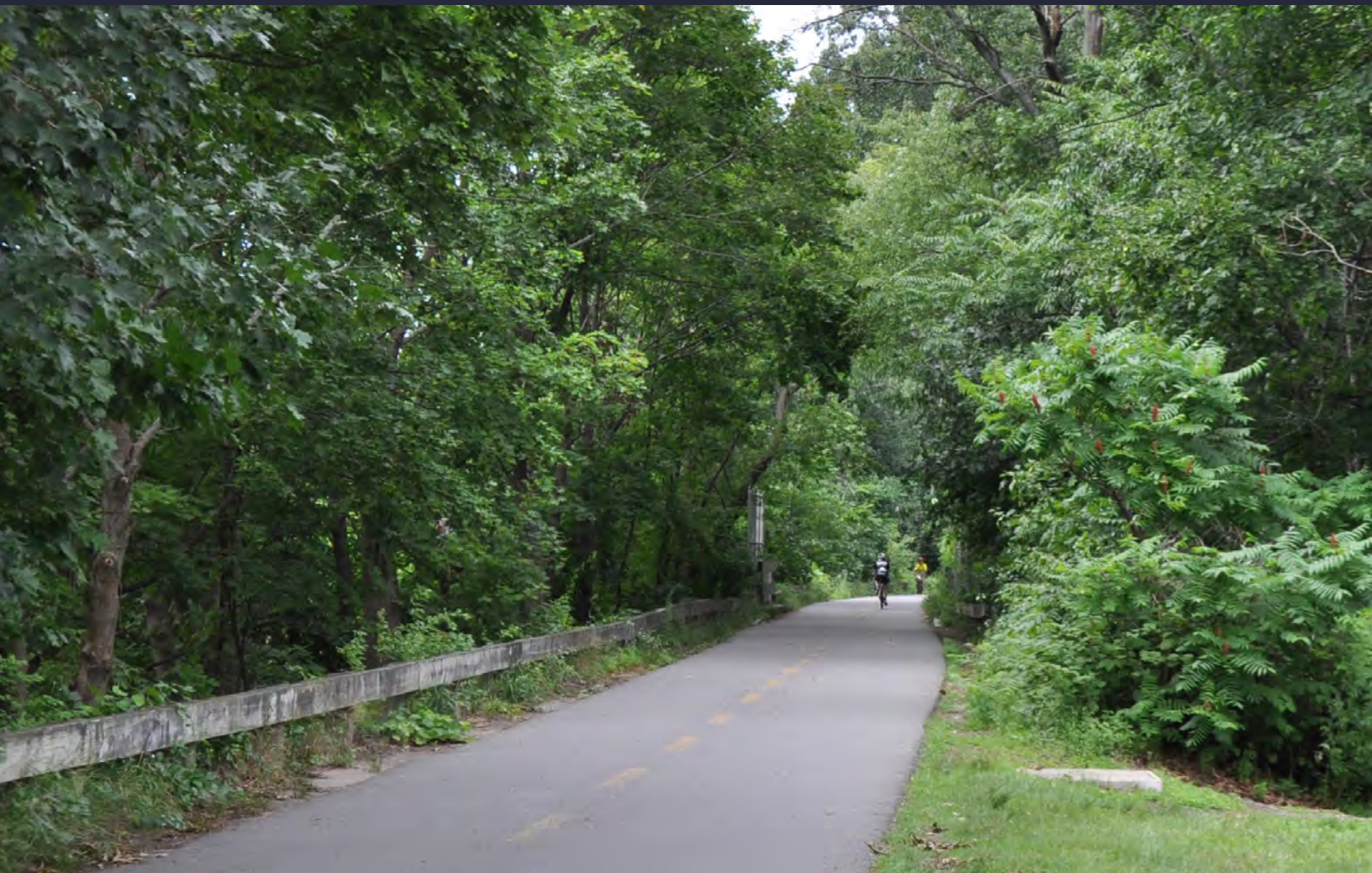


Town of Arlington, MA

Department of Planning and Community Development



Town of Arlington Minuteman Bikeway Planning Project



July 2022

PLAN OVERVIEW

Prepared for

Town of Arlington Department of Planning and Community Development

Town of Arlington Community Preservation Act Committee

Project Team

Adam Chapdelaine

*Former Town Manager,
Town of Arlington*

Daniel Amstutz, AICP

*Senior Transportation Planner,
Department of Planning and Community Development*

Jennifer Raitt

*Former Director,
Department of Planning and Community Development*

Susan Chapnick

*Chair,
Conservation Commission*

Tim Lecuivre

*Tree Warden,
Department of Public Works*

Ann LeRoyer

*Chair,
Open Space Committee*

David Morgan

*Environmental Planner/Conservation Agent,
Department of Planning and Community Development*

Michael Rademacher

*Director of Public Works,
Department of Public Works*

Corey Rateau

*Police Traffic Division,
Arlington Police Department*

Christopher Tonkin

*Chairman,
Arlington Bicycle Advisory Committee*

Kittelson & Associates, Inc.

Elizabeth Flanagan, AICP

Conor Semler

Caitlin Mildner

Megan Morrow

Alec Donowitz

GPI

Ronald Headrick, RLA

Robert White, RLA

Michael J. Shustack, PE

Nicole Rogers, PE

Sage Winter, ASLA, PLA

Funded by

Community Preservation Act

THIS PAGE LEFT INTENTIONALLY BLANK

Table of Contents

Executive Summary..... 4

EXISTING CONDITIONS OVERVIEW

Introduction 5

Existing Conditions Overview..... 7

Path Volumes..... 8

Crash History 9

Access Points 10

Waysides and Trailheads 11

Lighting..... 13

Signs..... 14

Artwork 14

Intersections..... 15

Maintenance Practices 15

Bridges..... 16

Drainage 16

Width and Engineering Constraints for Widening..... 17

VISION AND GOALS

Community Engagement..... 18

Vision for the Minuteman..... 20

Supporting Goals..... 20

Introduction 21

POLICY

Managing Speed 21

Managing Bikeway Demand 23

Jurisdictions..... 25

Existing Procedures..... 26

MAINTENANCE

Long-Term Recommendations..... 27

Short-Term Recommendations..... 29

Maintenance Costs..... 29

DESIGN RECOMMENDATIONS

Signs and Wayfinding 30

Creative Placemaking and Public Arts 51

Demand Management 55

Access Points, Waysides and Trailheads 71

Lighting..... 99

Introduction 109

Implementation Plan 109

Project List 110

Programming 112

Funding Sources 112

Administrative Strategy..... 114

Community Input 117

List of Figures

Figure 1. Minuteman Bikeway Extents 5

Figure 2. Key Destinations in Arlington 6

Figure 3. Low- and Moderate-Income Census Block Groups..... 6

Figure 4. Users of all needs and speeds use the Bikeway 7

Figure 5. Arlington Station in 1925 (Wikimedia Commons) 8

Figure 6. Existing informal path to Hurd Field..... 8

Figure 7. Daily Path Users, July - October 2019 9

Figure 8. Daily Path Users, July - October 2021 9

Figure 9. Existing Waysides, Trailheads, and Unimproved Access Points 11

Figure 10. Existing Lighting Density 13

Figure 11. Three different sign types for communicating user behavior..... 14

Figure 12. Water pools along the Bikeway..... 15

Figure 13. Crack sealing and overgrown vegetation 15

Figure 14. Existing Bridges and Underpasses 16

Figure 15. Typical Bikeway Uses..... 19

Figure 16. Example Breakout Group Comments 20

Figure 17. Word Cloud of responses to “Please indicate any additional comments, concerns, or recommendations for the Bikeway in Arlington. Where possible, please provide specific locations”20

Figure 18. E-bikes are gaining in popularity. E-bike imports have been surpassing electric cars in recent years. (Bloomberg) 22

Figure 19. Recommended Bicycle Network (Connect Arlington) 23

Figure 20. Existing etiquette sign 24

Figure 21. Clockwise from top: Etiquette signs from Hong Kong, HK, Atlanta, GA, and Town of Cary, NC 24

Figure 22. Arlington's "Request/Answer Center" 26

Figure 23. Japanese Knotweed along the Bikeway..... 28

Figure 24. The Norwottuck Rail Trail (Paul Cooper)..... 29

Figure 25. Examples of Wayfinding Signs..... 33

Figure 26. Examples from the Minuteman..... 33

Figure 27. Examples of Signage Families 35

Figure 28. Branding Examples 35

Figure 29. Wayfinding Context Map..... 36

Figure 30. Path Gateway..... 37

Figure 31. Hexagonal Paving 37

Figure 32. Art Installation at Night 37

Figure 33. Context Driven Graphics..... 37

Figure 34. Conceptual Identification and Orientation Signage 38

Figure 35. Regional and Local Map Scales..... 39

Figure 36. Conceptual Directional Signage..... 40

Figure 37. Replaceable Signage 41

Figure 38. Conceptual Informational Signage 42

Figure 39. Conceptual Informational Signage at Overlook 43

Figure 40. Proposed Wayfinding Plan 44

Figure 41. Section of Schwamb Mill 51

Figure 42. Inspirational Themes for Creative Placemaking 52

Figure 43. Available ROW 55

Figure 44. Narrowest segment of ROW between Mystic Avenue and Water Street 55

Figure 45. Widening via maintenance 56

Figure 46. Topography along the Bikeway 57

Figure 47. Typical Ground Plane Conditions 58

Figure 48. Cut/Fill Diagram 58

Figure 49. Ground Plane Manipulation..... 58

Figure 50. Typical Widening Options..... 59

Figure 51. Multiple Treadways with Separation..... 60

Figure 52. Potential Corridor Widening 62

Figure 53. Existing pavement markings on the Bikeway 69

Figure 54. An example of pavement markings that could be applied to the Bikeway to delineate where pedestrians and bicyclists are expected to travel within the path envelope (Kittelson & Associates, Inc.)..... 69

Figure 55. Bicycle Roundabout (VDOT) 69

Figure 56. Added curvature on a bicycle facility 69

Figure 57. Bicycle rumble strips designed to slow bicyclists (Joe Linton) 70

Figure 58. Examples of transverse pavement markings used on roadways to encourage slower speeds (Neal Hawkins and Joshua Ng Yew Wei, et al.) 70

Figure 59. Intersection Type and Distribution..... 71

Figure 60. Potential Access Improvements 72

Figure 61. Proposed Waysides and Trailheads..... 79

Figure 62. Schwamb Mill Site Plan 79

Figure 63. Foot of the Rocks Marker 79

Figure 64. Existing Mill Brook Crossing 80

Figure 65. Conceptual Sketch – Mill Brook Crossing 80

Figure 66. Schematic Plan of Improvements – Mill Brook..... 80

Figure 67. Existing images of Lowell Street Underpass..... 81

Figure 68. Existing/Proposed Sections at Underpass..... 81

Figure 69. Schematic Plan of Improvements – Mill Lane..... 82

Figure 70. Old Schwamb Mill 82

Figure 71. Foot of the Rocks Postcard 82

Figure 72. Schematic Plan of Improvements – Ryder Street / Summer Street Field / Ed Burns Arena . 83

Figure 73. Conceptual Sketch of Street Crossing Improvements – Mill Street 85

Figure 74. Schematic Plan of Improvements – Buzzell Field / Mill Brook Crossing 86

Figure 75. Cooke's Hollow / Mill Brook 86

Figure 76. Cooke's Mill Lane Marker 86

Figure 77. Conceptual Sketch of Street Crossing Improvements – Water Street 87

Figure 78. Conceptual Sketch of Street Crossing Improvements – Massachusetts Avenue / Swan Place / Mystic Street 90

Figure 79. Sketch of Short-Term Improvements – Spy Pond Field / Whittemore Street 91

Figure 80. Schematic Sketch of Long-Term Improvements – Spy Pond Field / Whittemore Street..... 91

Figure 81. Schematic Plan of Improvements – 21 Pond Lane 92

Figure 82. Conceptual Sketch – Spy Pond Overlook..... 93

Figure 83. Schematic Plan of Improvements – Spy Pond Overlook 93

Figure 84. Conceptual Sketch of Street Crossing Improvements – Linwood Street 95

Figure 85. Sketch of Short-Term Improvements – Orvis Circle 96

Figure 86. Conceptual Options – Neighborhood Entries..... 96

Figure 87. Conceptual Sketch of Street Crossing Improvements – Lake Street 97

Figure 88. Sketch of Short-Term Improvements – Brooks Avenue / Varnum Street 98

Figure 89. Sketch of a Possible long-Term Vision – Brooks Avenue / Varnum Street 98

Figure 90. Assessment of Existing Lighting Locations 99

Figure 91. Proposed Lighting of Lake Street 100

Figure 92. Five Principles for Responsible Outdoor Lighting 101

Figure 93. Typical Cross Section with Lighting 102

Figure 94. Controlled Light Distribution 102

Figure 95. LED Light Distribution 103

Figure 96. LED Light Distribution 103

Figure 97. Lighting Options 104

Figure 98. Hypothetical Lighting Plan 105

Figure 101: Existing Wayside and Trailhead Components 127

List of Tables

Table 1. Wayside and Trailhead Example Components..... 11

Table 2. Types of Signs on the Bikeway..... 14

Table 3. Examples of Existing Art Displays..... 14

Table 4. Intersection Existing Conditions, Observations, and Issues 15

Table 5. Typical Drainage Applications..... 16

Table 6. Maintenance Operations Examples 27

Table 7. Maintenance Capital Program Examples 28

Table 8. Routine Maintenance Costs per Mile 29

Table 9. Applicable Bikeway Regulatory Signs 31

Table 10. Applicable Bikeway Warning Signs 32

Table 11. Wayfinding Examples 34

Table 12. Unit Cost of Wayfinding Signage 41

Table 13. Simple Pavement Widening..... 56

Table 14. Corridor Widening Examples..... 60

Table 15. Multiple Treadways Examples 61

Table 16. Mill Street Crossing Recommendations..... 84

Table 17. Water Street Crossing Recommendations 87

Table 18. Massachusetts Avenue Crossing Short-term Recommendations 88

Table 19. Linwood Street Crossing Recommendations..... 94

Table 20. Lake Street Crossing Recommendations 97

Table 21. Existing Lighting Along the Minuteman Bikeway 100

Table 22. Approximate Costs of Lighting Improvements 108

Table 23. Project List (by Section of Bikeway) 110

Table 24. Recommended Programming Initiatives 112

Table 25. Potential Funding Strategies: Federal..... 112

Table 26. Potential Funding Strategies: State..... 113

Table 27. Potential Funding Strategies: Local 113

Table 28. Potential Funding Strategies: Private/Non-Profit..... 114

Table 29. Bikeway Project Development Responsibilities..... 114

Table 30. Existing Wayside and Trailhead Observations 126

Appendices

Appendix A: Existing Conditions Report 116

Appendix B: Community Input..... 118

EXECUTIVE SUMMARY

The Minuteman Bikeway in Arlington, MA is a cherished and highly used regional multi-modal corridor. This planning study explores opportunities to improve the Bikeway so that it is a safe, pleasant, and low stress path for all ages and abilities.

By virtue of its popularity, the Bikeway faces challenges related to crowding, differences in speed between users, and expectations of user behavior.

The Minuteman Bikeway sees 2,600 users on a given day and is used by people commuting and recreating alike. Speed differentials between people walking and biking contribute to feelings of overcrowding. This study considers opportunities to manage speed on the Bikeway to promote a safe and comfortable experience as well as managing demand through widening, setting expectations for user behavior, and other methods. **See Chapter 3 and Chapter 5.**

Many challenges along the Bikeway can be addressed through improved maintenance practices.

This study looks at current maintenance needs as well as how the Town of Arlington can craft a maintenance program that can more effectively anticipate and react to new maintenance needs in the long-term. **See Chapter 5.**

The Bikeway is a unique asset, and the community is interested in creating a more cohesive and immersive experience through wayfinding, branding, and placemaking.

The Minuteman is steeped in history and cultural and environmental landmarks. Today, however, the corridor lacks a clear identify. This study explores ways to enhance user experience by highlighting these areas of interest and providing strategies for connecting people to and from the Bikeway throughout the Town of Arlington. Opportunities to create or upgrade trailheads and waysides are considered in this study as ways to support people as they access and get oriented to the Bikeway, rest and regroup, become immersed in their surroundings, and recreate. **See Chapter 5.**

The study concludes with an implementation plan of projects, potential fundings sources, and essential partnerships. **See Chapter 6.**

Existing Conditions OverviewChapter 1

Vision and GoalsChapter 2

Policy RecommendationsChapter 3

Maintenance RecommendationsChapter 4

Design RecommendationsChapter 5

Implementation RecommendationsChapter 6



Chapter 1 EXISTING CONDITIONS

INTRODUCTION

The Minuteman Commuter Bikeway (Bikeway) is a ten-mile, regional shared-use path extending through Bedford, Lexington, and Arlington and connecting to the Alewife MBTA station in Cambridge. The Bikeway was built in 1993 along disused Massachusetts Bay Transportation Authority (MBTA) rail right-of-way. The Town of Arlington leases the property for the 3.6 miles within its boundaries from the MBTA (**Figure 1**) and is responsible for the maintenance and upkeep of the Bikeway. Roughly paralleling Massachusetts Avenue, which is the primary transportation and commercial corridor through the town, the Bikeway is a critical off-street transportation and recreation facility that is heavily used by people of all ages and abilities, using different modes, and with different needs and speeds.

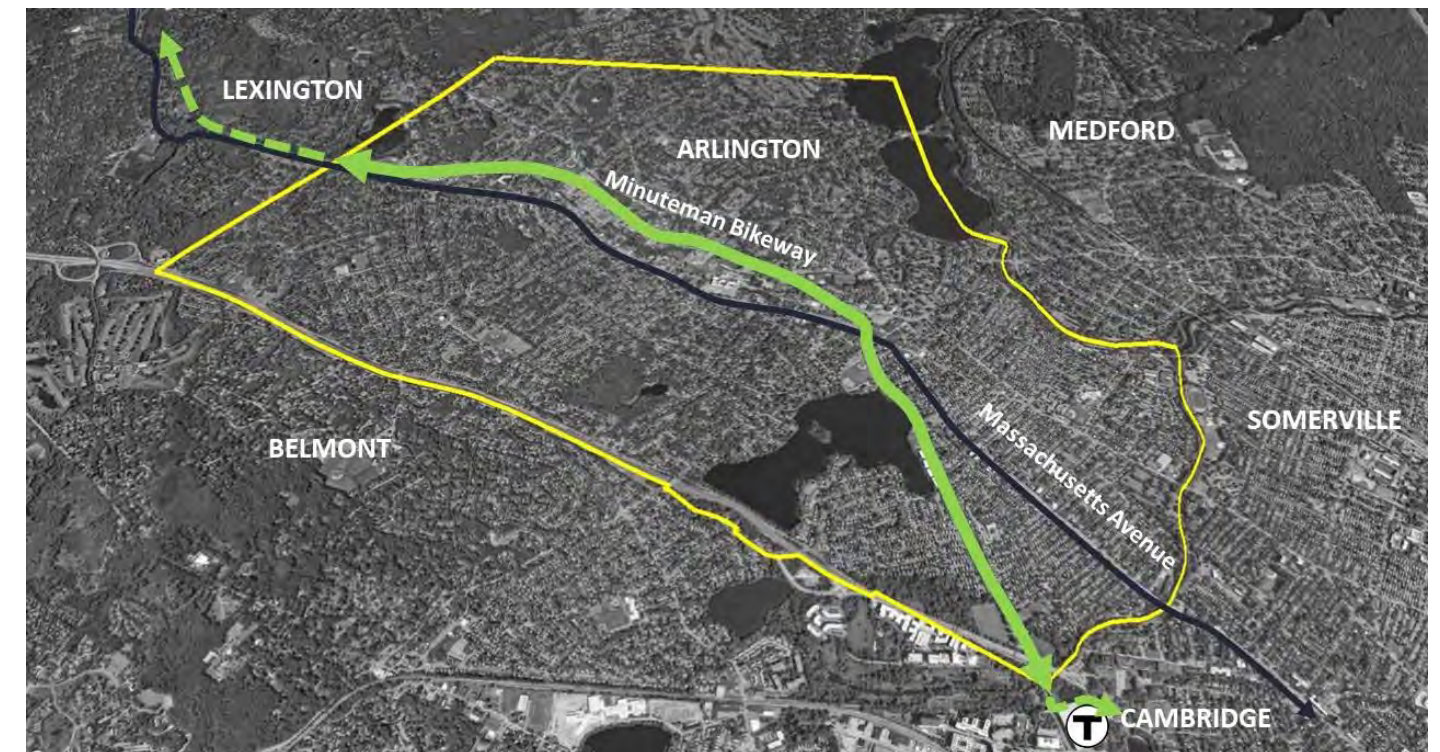
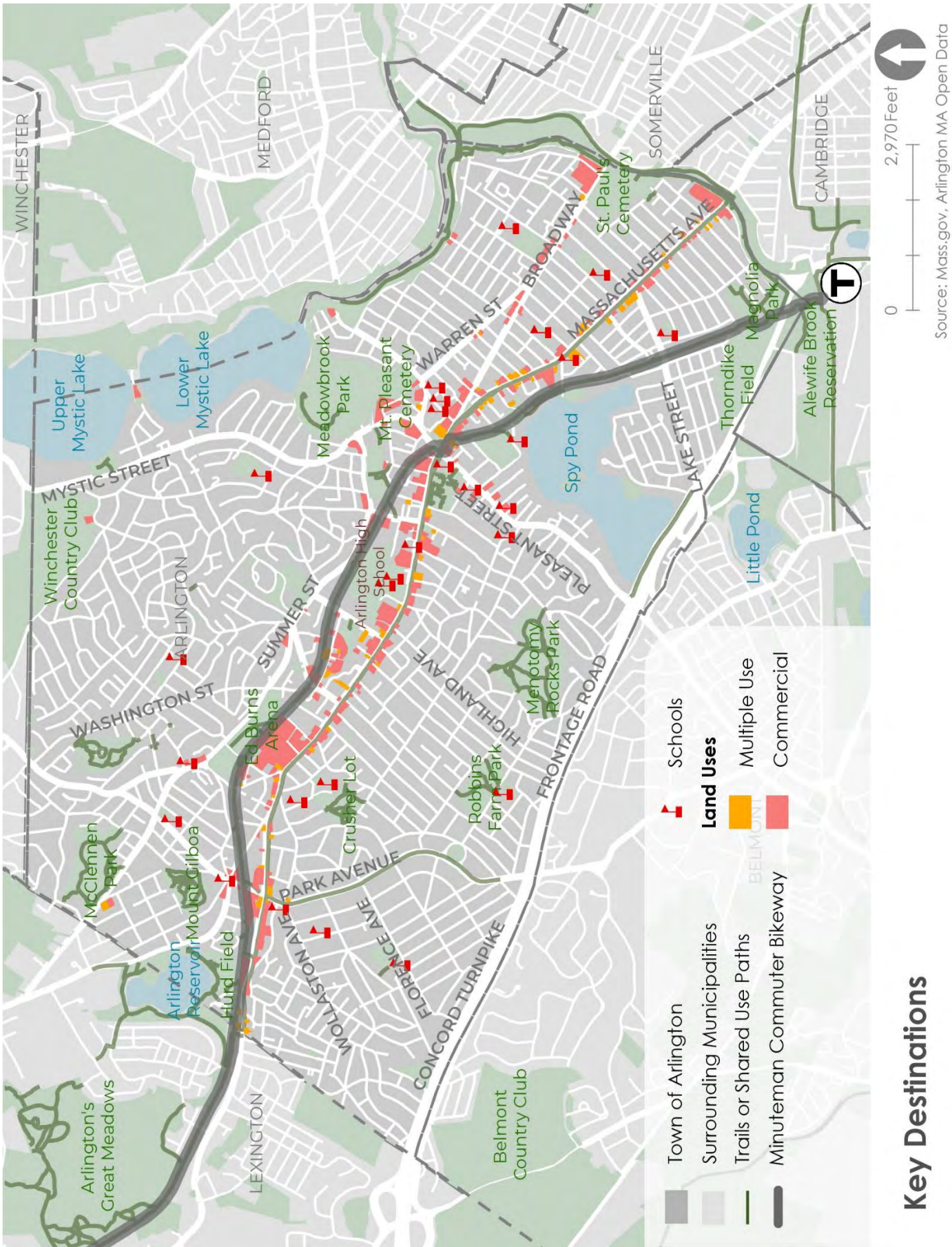


Figure 1. Minuteman Bikeway Extents

Among its many benefits, the Bikeway provides a safe route across town, allowing residents and commuters from neighboring communities to walk or bike to key destinations instead of drive. Because the Bikeway parallels Massachusetts Avenue, it is a logical means to access businesses and municipal facilities located along the arterial and the three main commercial districts of Arlington Heights, Arlington Center, and East Arlington. **Figure 2** shows the parcel-level commercial and mixed land uses throughout Arlington, highlighting the concentration of destinations and opportunities accessible via the Bikeway. The path provides direct access to multiple schools, including Arlington High School, which abuts the path, and Hardy Elementary School. It also connects to a number of open space and recreational facilities, including Hurd Field, Ed Burns Arena, Buzzell Field Park, Spy Pond, and Magnolia Park/Thorndike Field. The Low- and Moderate-Income Census Block Groups in Arlington (**Figure 3**) largely border Massachusetts Avenue and the Bikeway; the Bikeway is an important transportation corridor that connects the Town's most vulnerable populations to key destinations safely and affordably. Furthermore, the Bikeway itself is a destination, granting path users access to green space, trees, and public art, separated from vehicle stress, noise, and pollution.

Figure 2. Key Destinations in Arlington



Key Destinations

Figure 3. Low- and Moderate-Income Census Block Groups



Low and Moderate Income Block Groups

The Minuteman Bikeway in Arlington is a highly used and much-loved facility. However, it faces challenges due to its success, including crowding and speed disparities between users. Although the Bikeway is more comfortable than riding in or walking alongside vehicle traffic, the density of users leads to discomfort and safety concerns. At-grade roadway crossings also present challenges for safety and comfort. While sections have been rehabilitated, the Bikeway has not been fully repaved since its construction and faces on-going maintenance challenges. Over time, the Bikeway has accumulated a patchwork of design interventions, placemaking elements, and maintenance, leading to an inconsistent and unpredictable experience. This study reviews and assesses the key challenges facing the Bikeway throughout its extents in Arlington to understand how to keep the Bikeway safe and accessible to all types of users and to plan for future investments.

This planning study has explored the existing conditions along the Bikeway in Arlington and provides planning level recommendations related to the following topics:

- Policy
- Maintenance
- Signs and Wayfinding
- Creative Placemaking and Public Arts
- Demand Management
- Access Points, Waysides and Trailheads
- Lighting

The study concludes with an implementation plan of projects, potential fundings sources, and essential partnerships.



Figure 4. Users of all needs and speeds use the Bikeway

EXISTING CONDITIONS OVERVIEW

The project team conducted a literature review of existing plans, policies, and projects, conducted site visits, and synthesized available data to understand the existing conditions along the Bikeway and the background behind some of the challenges faced. The key findings from the existing conditions review are included here. The complete Existing Conditions Report can be found in **Appendix A**.

The key challenges identified through the existing conditions review of the Minuteman Bikeway include:

- Crowding and speed disparities
- Wayfinding/inconsistent signing
- Maintenance of the bikeway surface, vegetation, and drainage
- Visibility
- Inconsistent path identity
- Safety and ADA compliance at access points
- Safety and consistent user expectations at roadway crossings

Past Planning Efforts

- Past planning efforts along the Minuteman have provided general recommendations related to wayfinding and signage, intersection improvements, trailhead and waysides, partnerships, community outreach, public safety, maintenance, and future improvements but have not gone into specific detail for the Town of Arlington.
- Past planning efforts have called for:
 - Improved lighting to increase visibility and safety along the Bikeway at night
 - Exploration of opportunities to widen the Bikeway and/or establish a safety program through design and messaging
 - Add and improve neighborhood connections
 - Connect Bikeway users to the Town's Business Districts
 - Incorporate trailhead and wayside components to enhance user experience

Bikeway Use Policies in Arlington

- The Minuteman Bikeway is supported by a Tri-Town Bike Committee made up of volunteer representatives from Arlington, Lexington, and Bedford Bicycle Advisory Committees.
- In 2020, the Arlington Department of Planning and Community Development explored the installation of a non-regulatory speed limit of 15 mph on the Arlington section of the Bikeway but determined that such a policy was not appropriate at the time.
- As of 2020, there are no restrictions on the hours of use for the Bikeway.



Figure 5. Arlington Station in 1925 ([Wikimedia Commons](#))

Use Agreements

- The Bikeway is located within an inactive rail corridor owned by the MBTA. The Town of Arlington has a License Agreement with the MBTA allowing the Town to maintain the Bikeway. All new construction has to be approved by the MBTA.

New Access and Connections

Four new access points to the Bikeway are being proposed or in process at the time of writing.

- Arlington Reservoir Connection: The Town of Arlington received grant funding through MassTrails to design and engineer an ADA-compliant pathway connecting the Bikeway to the Arlington Reservoir through Hurd Field.
- Mystic River Path Connection: In 2021, the Town of Arlington received grant funding through MassTrails to conduct a feasibility study of a connection between the Mystic River path and the Bikeway via the Mystic Valley Parkway along the south side of lower Mystic Lake and along Summer Street in Arlington.
- Arlington High School (AHS) Connection: A pathway connection between the Bikeway and Arlington High School has been designed as part of the reconstruction of AHS. This connection will be completed via a bicycle and pedestrian ramp north of the W. A. Peirce Field and is expected to start construction in 2024.
- 19R Park Avenue Connection: A pathway connection between the 19R Park Avenue affordable housing development and the Bikeway was approved by the Arlington Redevelopment Board and is seeking funding and design approval.



Figure 6. Existing informal path to Hurd Field

PATH VOLUMES

- Bike volumes tend to dip in the winter months while pedestrian volumes are more consistent throughout the year.
- During the COVID-19 pandemic, volumes varied day by day more than before the pandemic, likely due to fewer commuters and less structured hours while many worked from home.



2600
Average
Daily Path
Users



44% walking



56% biking

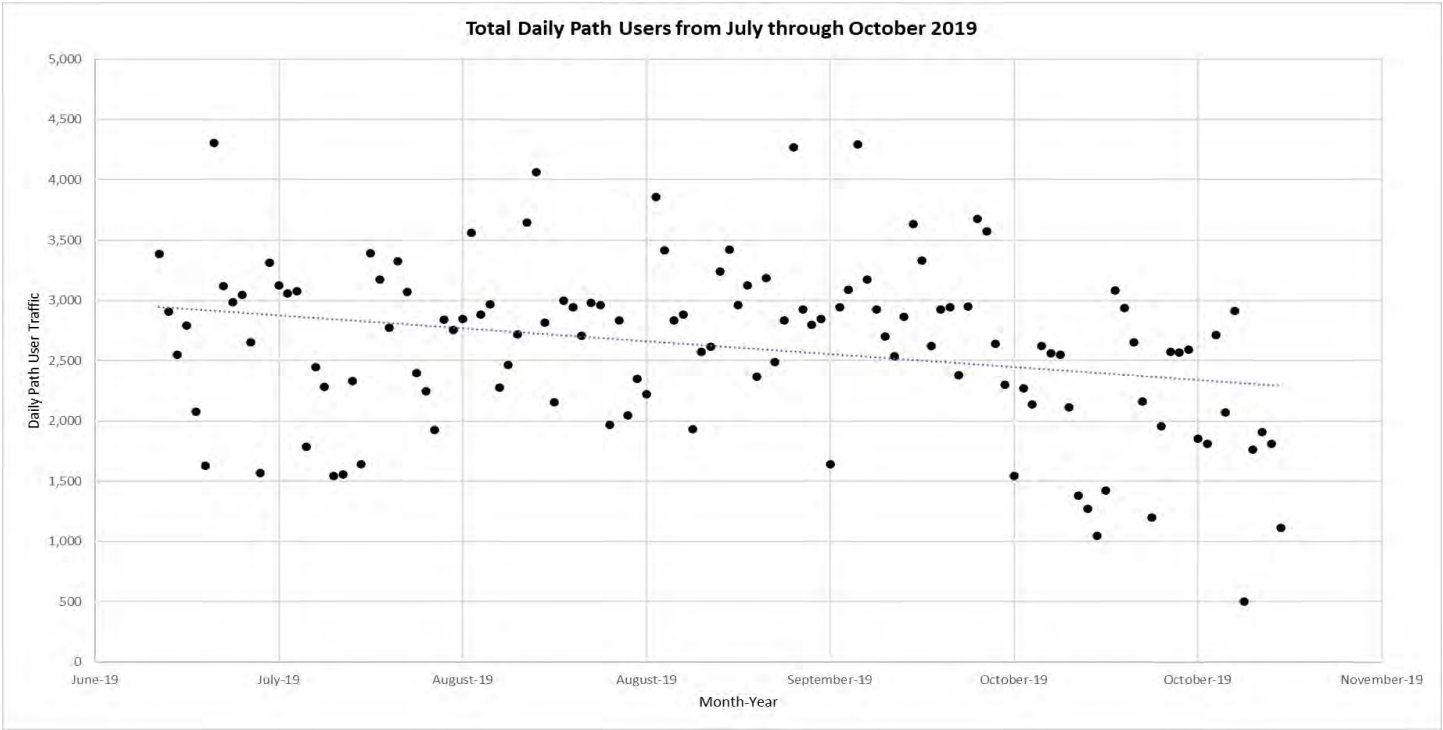


Figure 7. Daily Path Users, July - October 2019

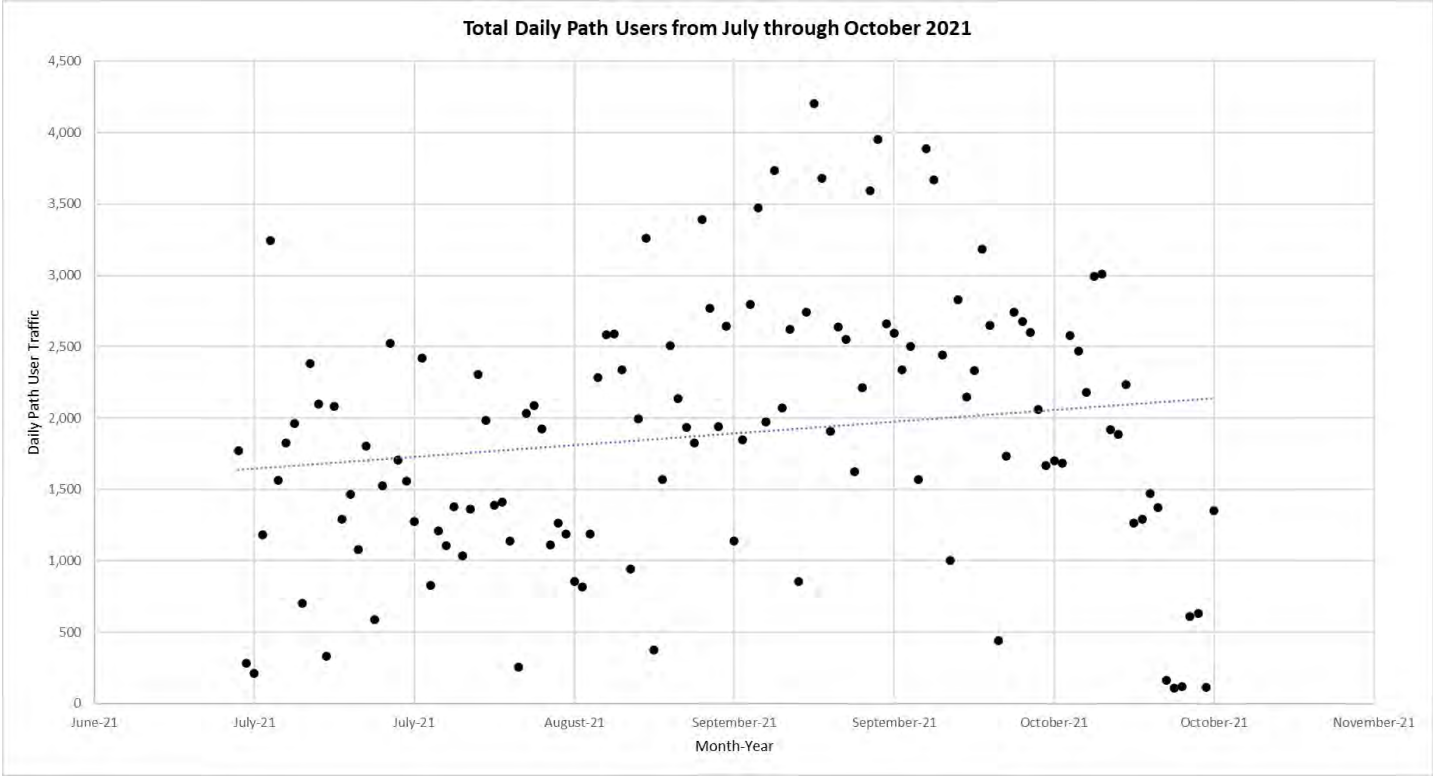


Figure 8. Daily Path Users, July - October 2021

CRASH HISTORY

- The project team reviewed crashes involving non-motorists in the vicinity of the Bikeway between January 2017 and September 2021.
- 35 crashes eight crashes resulted in injuries to at least one involved party.
- The most common crash locations were the intersections of the Bikeway and Lake Street (11), Mill Street (6), Water Street (5), and Massachusetts Avenue (4).
- 84 citations were issued at the intersection of the Bikeway and Lake Street between 2017-2021. These citations were often issued in clusters, with several on the same day, so it can be assumed they were likely part of a focused patrol effort preceding the Fall 2020 improvements.
- A fatal crash between two bicyclists on the path in Lexington in 2019 has highlighted the need for safety and travel demand management improvements along the corridor as a whole.

Between 2017 and 2021, 35 crashes involving someone walking or biking were reported on the Bikeway or at a cross street.

ACCESS POINTS

- The Bikeway has a mix of formal access points at street crossings and adjacent parks, as well as many informal or unimproved access points.
- The addition or alteration of entry and access points requires clear coordination with the MBTA's Real Estate Division.
- Access points are not evenly distributed:
 - The western portion of the Bikeway is mostly grade-separated, resulting in few access points at street crossings or neighborhoods.
 - The eastern portion of the Bikeway is generally at grade, allowing for more access opportunities.
- The primary issues are:
 - Unpaved access points
 - Obstructed sightlines
 - Inaccessible slopes or stairs

Visibility is restricted at 39 of 45 access points

THIS PAGE LEFT INTENTIONALLY BLANK

Waysides, Trailheads, and Access Points

Waysides and trailheads are locations that serve a mix of utilitarian and recreational purposes in support of the Bikeway. When applied at logical locations - such as at intersections, vistas, or other regular intervals - waysides and trailheads provide amenities that create a sense of place, orientation, and comfort. **Table 1** lists example components of waysides and trailheads.

Waysides

Waysides are defined for the purpose of this study as locations along the side of a shared use path or trail corridor where people can stop to rest, regroup, immerse, or recreate.

Trailheads

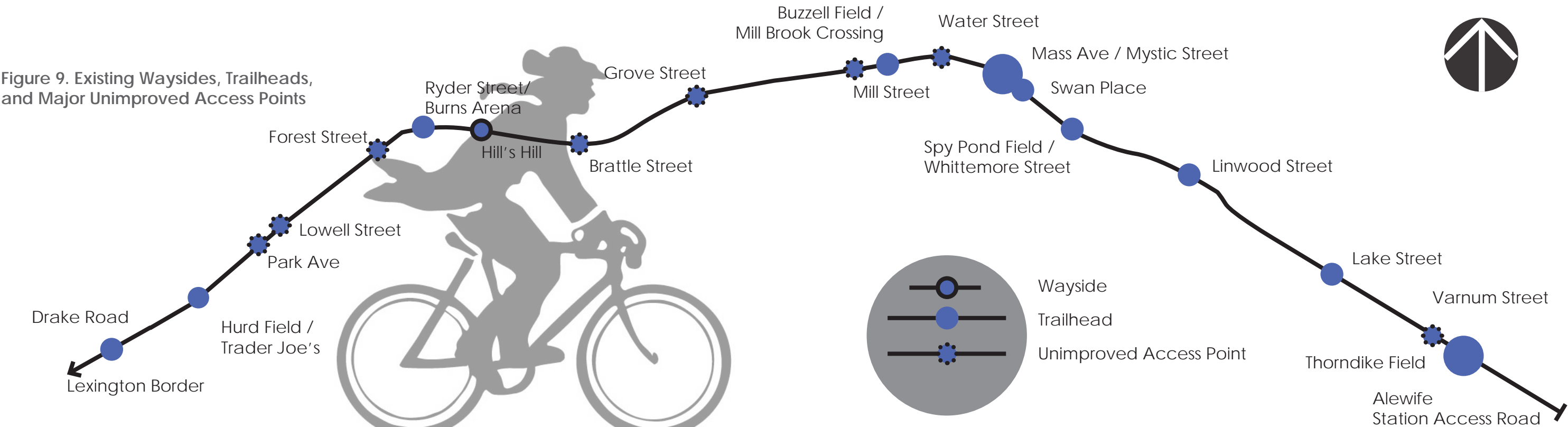
Trailheads may serve these same purposes but are located at key multimodal access points where path users transition from other facilities or the street network into the Bikeway. Trailheads should include information such as maps, rules, policies, and path user etiquette expectations to orient people as they enter the facility. They should also include infrastructure that assists in transitioning between networks such as vehicle parking or bike rental stations.

Unimproved Access Points

Some access points do not have the components of either a wayside or a trailhead.

Table 1. Wayside and Trailhead Example Components

Component Purpose	Example Components	Wayside	Trailhead
Access and orient	Informational signs or kiosks with maps, rules, and policies		X
	Vehicular parking		X
	Bike rental stations		X
	Bike repair stations	X	X
Rest, and regroup	Seating	X	X
	Views and vistas	X	
	Landscaping and plantings	X	X
	Pull offs for pausing out of the way of path traffic	X	
	Trash receptacles	X	X
	Water Filling Stations	X	X
	Bike parking	X	X
Immerse	Public art	X	X
	Cultural, historical, or educational exhibits	X	X
	Natural areas	X	X
Recreate	Multi-use fields	X	X
	Sports and exercise equipment	X	X
	Playgrounds	X	X
	Secondary paths	X	



Existing Trailheads, Waysides, and Major Unimproved Access Points

Major Trailheads with vehicle parking include the following:

- Hurd Field
- Ryder Street
- Linwood Street
- Thorndike Field

Open Spaces immediately adjacent to the Minuteman Bikeway that allow active or passive recreation, and include the following:

- Hurd Field
- Summer Street
- Buzzell Field
- Spy Pond Field
- Spy Pond
- Scannell Field
- Thorndike Field
- Magnolia Field

Side Trails, e.g., secondary pathways off the main trail that allow departure and exploration.

- Arlington Reservoir
- Hill’s Hill
- Mill Brook loops

Interpretive Features such as 1) locations where one can directly see the focus of the interpretation, or 2) locations that introduce the path user to places that are not single entities but rather significant persons, places, uses or events. These included environmental, cultural, or historic themes. The combination of compelling sitework, graphic images, and storytelling enhance what the visitor is experiencing.

- Mill Brook crossings
- No Name Brook
- Schwamb Mill
- Foot of the Rocks Memorial
- Former Train Station Depots
- Uncle Sam Plaza
- Spy Pond - Ice harvesting

A full summary of observations and existing wayside and trailhead components along the Bikeway can be found in the Existing Conditions Report (Appendix A).

THIS PAGE LEFT INTENTIONALLY BLANK

LIGHTING

- Street lighting is found at each at-grade crossing but there is a lack of lighting at most other access points.
- There is sporadic light that spills onto the Bikeway from abutting properties.

Although the Bikeway is open at all times of day, lighting is generally sparse.

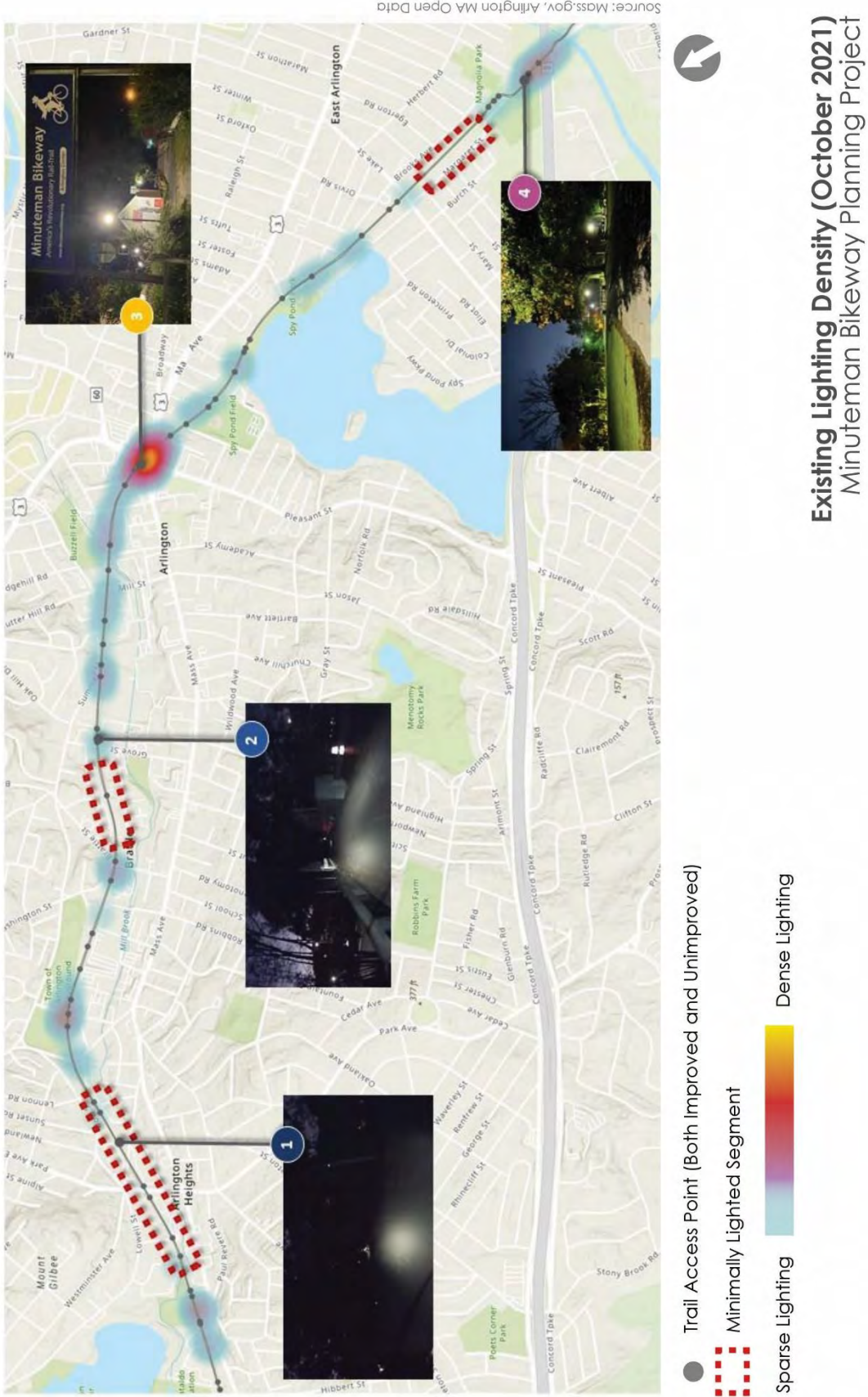
Low lighting at Route 2 underpass

Lighting at at-grade street crossing

Light from abutting property



Figure 10. Existing Lighting Density




Existing Lighting Density (October 2021)
Minuteman Bikeway Planning Project

SIGNS


A variety of signs are used on the Minuteman Bikeway; these signs range from kiosks with information about local events to directional wayfinding, to regulatory and warning signs similar to those found on street. In general, the application of signs used to communicate landmarks, wayfinding, right-of-way, policies, and user etiquette is inconsistent both in application and choice of sign. The following types of signs can be found on the Bikeway:

Table 2. Types of Signs on the Bikeway


Informational




Regulatory




Gateway




Warning





Wayfinding




Path Use









The application of signs on the Bikeway is not consistent.

Figure 11. Three different sign types for communicating user behavior

ARTWORK

- Art appears on the Bikeway through a few different channels:
 - Pathways: Art on the Minuteman was launched in 2017.
 - The Arlington Commission for Arts and Culture commissions art displays along the trail.
 - Over the years, there have been other unsanctioned “guerilla” installations along the Bikeway.
- Existing art installations are tucked along the Bikeway.

Artwork is concentrated in the Spy Pond area and Ed Burns Arena area.

Table 3. Examples of Existing Art Displays



Art along the Bikeway



UnknownGo Out Doors

INTERSECTIONS

- The Bikeway intersects five streets at-grade as it runs through the Town of Arlington.
- These intersections vary in their traffic control, the typical vehicle volumes, and ease of crossing.
- Key challenges include:
 - Varied traffic control (Stop, RRFB, Bicycle Signal, Pedestrian Signal)
 - Varied pavement markings
 - Understanding correct user priority
 - Sight lines for vehicles and path users
 - ADA compliance

Table 4. Intersection Existing Conditions, Observations, and Issues



MAINTENANCE PRACTICES

- The Town is responsible for maintaining the Bikeway.
- MBTA is responsible for maintaining the structural integrity of any overpasses or bridges which they maintained prior to the lease agreement with the Town.
- The Town Manager oversees maintenance.
- Tasks such as mowing, patching asphalt, and vegetation pruning are carried out by the Department of Public Works on an as-needed basis.

The following entities and stakeholders are frequently or occasionally involved in issues related to the Bikeway:

- Town Manager
- Arlington Bicycle Advisory Committee (ABAC)
- Transportation Advisory Committee (TAC)
- Arlington Select Board
- Tree Committee
- Open Space Committee
- Parks and Recreation Commission
- Community Preservation Act Committee
- Capital Planning Committee
- Arlington Commission for Arts and Culture (ACAC)
- MBTA Real Estate Division
- Department of Public Works (DPW)
- Conservation Commission
- Arlington Recreation

Maintenance challenges along the corridor can broadly be categorized as issues related to the bikeway surface, vegetation, drainage, and bridge decks.



Figure 12. Water pools along the Bikeway



Figure 13. Crack sealing and overgrown vegetation

BRIDGES

- The former rail bridges along the Bikeway allow for an experience that is fully separated from vehicles but pose challenges when it comes to accessing the Bikeway from the street network.
- The bridges are too narrow for Public Works maintenance equipment to cross.
- On the border between Arlington and Cambridge, the prefabricated bridge over Alewife Brook poses a hazard to path users due to its lack of ramps and rough surface. The bridge is due for maintenance in collaboration with Cambridge.

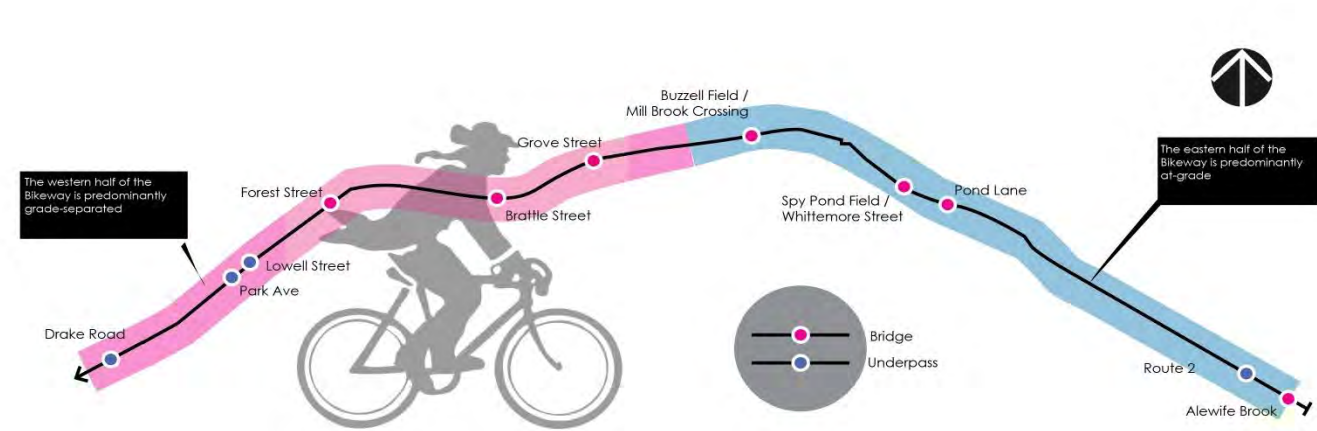


Figure 14. Existing Bridges and Underpasses

DRAINAGE

- Formal drainage along the Bikeway is limited. Most of the Bikeway uses country drainage where water sheds off the path and disperses into the surrounding landscape.
- Water sheeting across the Bikeway, and in the winter, freezing, is a key challenge.
- Overgrown vegetation blocks water from draining appropriately in many locations with country drainage

Table 5. Typical Drainage Applications

Country
Drainage



Stone Box
Culvert



Swales



Catch
Basins



Cross
Culverts



Waterways



WIDTH AND ENGINEERING CONSTRAINTS FOR WIDENING

- Based on the Shared-Use Path Level of Service Calculator, published by the Federal Highway Administration, the Bikeway would require an additional six feet of width to improve the level of service from B to A¹. However, adding any increment of width would still be valuable to trail users, even if only provided on select, strategic segments.
- The ability to widen within the MBTA right of way depends on coordination with and approval by the MBTA.
- Feasibility is also dependent on existing barriers such as:
 - **Grade-separated crossings** place constraints on the width of the Bikeway and already serve as significant pinch points today
 - In some areas, **water features**, such as marshes and streams, create obstacles to widening the Bikeway.
 - The Bikeway runs adjacent to private property, open space parcels, and other property boundaries along much of the Arlington stretch. In general, the paved path is situated approximately in the middle of the MBTA right of way, but in a few locations, the Bikeway runs closer to the edge of property lines, creating **constrained right-of-way**
 - Natural topography represents a **grading** barrier to widening in many locations. Several stretches of the Bikeway are marked by steep downward slopes beyond the edge of the paved width, likely due to the historical use as a railbed

Looking for opportunities to widen the Bikeway is an important first step in determining an approach for managing high volumes.

Grade-Separated Crossings



Water Features



Constrained Right of Way



Grading



¹ Table 12. Shared-use path level of service look-up table, typical mode split
<https://www.fhwa.dot.gov/publications/research/safety/pedbike/05138/05138.pdf>



Chapter 2 VISION AND GOALS

COMMUNITY ENGAGEMENT

Outreach Events

Throughout the Bikeway planning process, the project team and the Town of Arlington engaged with the public to better understand user experiences, major issues, and opportunities for improvement. Outreach began with the distribution of an online survey via the Town of Arlington mailing list, the Minuteman Bikeway website, and the Arlington Bicycle Advisory Committee. The Town used several avenues for advertising the public meetings and survey, including yard signs and flyers along the Bikeway, social media channels, and email distribution through the Boston MPO, MassBike, and Arlington Public Schools. The survey was also conducted as an intercept survey along the Bikeway. In total, the survey received 1,688 responses.

In addition to the survey, three virtual public meetings were conducted. The first meeting was held in early November 2021 and 65 people were in attendance. This meeting focused on informing the public of the scope of the project, establishing a set of shared expectations, and sharing the results of the existing conditions analysis. A breakout session during the meeting allowed attendees to share their personal experiences, concerns, and wishes for the Bikeway.

The second public meeting was held in early March 2022 and 38 people were in attendance. This meeting focused on the topics of access points, trailheads, and waysides. After sharing a brief summary of the public survey results, the presenters provided an introduction to the types of amenities and activities that could be included in the definitions of access points, trailheads, and waysides. Interactive polling gave meeting attendees an opportunity to share the amenities and experiences most important to them. The polling responses are included in Appendix B.

The third public meeting was held in late June 2022 and 22 people were in attendance. This meeting provided an overview of the final plan elements. After revisiting the project purpose and timeline, the presenters shared an outline of the topics addressed in the plan and highlighted several key recommendations. Attendees were given the opportunity to ask questions about the plan.

Community Input

Across all the community engagement, one thing was very clear: there is a tremendous amount of love for the Minuteman Bikeway. Residents of Arlington, abutters of the Bikeway, children, seniors, and visitors alike enjoy the Bikeway for its natural beauty and shade, its separation from cars, and its accessibility to destinations, among many other reasons. Because there is so much love for the Bikeway, there is also high demand for the limited space, often leading to crowding, conflicts among users, and varying user needs.

Key findings from the survey and public meetings that support the vision and goals are included below. The original survey questions, individual responses, and full notes from the public meetings are included in Appendix B.

The Bikeway is used often, for many reasons, and by many modes

- 61% of respondents visit the Bikeway every day or a few times a week.
- Although the path was established as the “Minuteman Commuter Bikeway” 30 years ago, it is now used for many different purposes via many different modes, as shown in **Figure 15**.

- Notably, 90% of survey respondents said they use the Bikeway for exercise or health, followed by 69% who use it for recreation or socialization, while only 32% use it to commute to work or school.²
- While plenty of users do use the Bikeway to bike, walk, or run, many also roller blade, skateboard, or scooter and they commonly travel with children (64%), their pets (34%), or pushing strollers (27%).

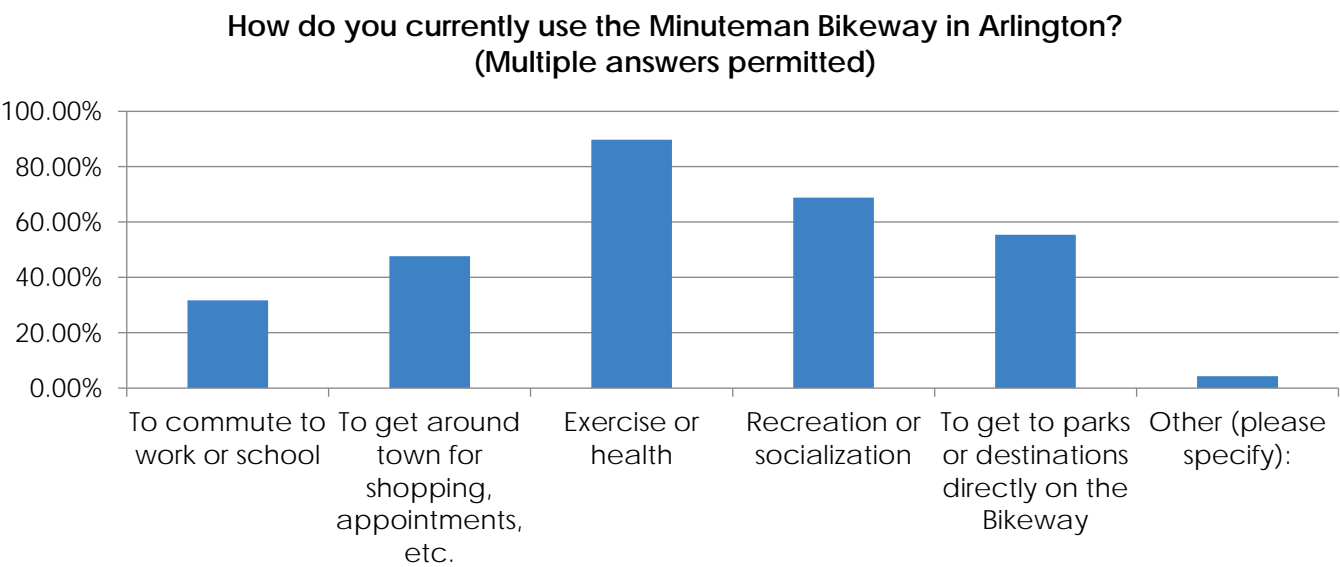


Figure 15. Typical Bikeway Uses

Bikeway users value safety, comfort, and having space to travel away from vehicles among natural beauty.

- Nearly 70% of respondents ranked “separation from vehicles” and “safety and comfort for all users” as very important. These sentiments were echoed during the public meeting breakout sessions, when attendees shared that the separation from cars and other traffic is one of the main reasons they enjoy the Bikeway.
- More than half of respondents believed the following to be important or very important:
 - Access to nature (61%)
 - Responsible and safe use of electric bikes and scooters (60%)
 - Access to neighboring cities/towns (Lexington, Cambridge, Somerville, etc.) (57%)
- During the second public meeting, attendees consistently ranked amenities related to immersion in the natural beauty of the Bikeway as important to them. These included things such as views and vistas, natural landscapes that are interesting and relaxing, and pull offs for pausing out of the way of path traffic.
- Access to art, bathrooms, and other transportation facilities were generally ranked as less important by survey respondents. However, although these items ranked lower when compared to issues like safety and comfort, a desire for amenities and art came through in open ended questions and responses at the public meeting.

There is room for improvement.

Survey respondents were also asked to evaluate how well the Bikeway meets a list of criteria on a scale of very poor to excellent. Most of the criteria were ranked as good on average, suggesting that users are generally satisfied with the conditions of the Bikeway. However, several criteria notably received lower rankings.

- 68% of respondents ranked “lighting” as poor or very poor. Comments received during the public meeting reiterated this concern.
- Nearly half of respondents gave poor or very poor rankings to the following criteria:
 - Signage, maps, and wayfinding to the path and nearby destinations (47%)
 - Path user etiquette (passing and yielding behaviors, speeding, etc.) (46%)
 - Space for all modes and users to operate comfortably (45%)
- During the first public meeting, many attendees cited crowding, unpredictable or impolite user behavior, and lack of lighting, particularly during the winter months, as issues standing in the way of enjoying the Bikeway or using it more frequently.

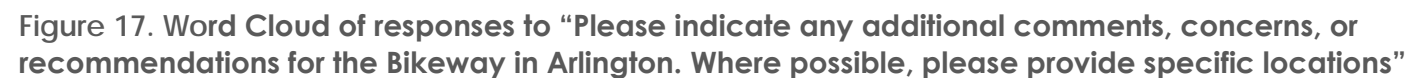
Users share common concerns and views.

The survey and public meetings also provided opportunities for the community to share, in their own words, any comments, concerns, or recommendations for the Bikeway in Arlington. A sample of the comments recorded during the public meeting is shown in **Figure 16** and a word cloud of the responses to the open-ended survey question is shown in **Figure 17**.

These responses and conversations revealed additional common concerns and views that were not captured in the preset survey questions, including:

- Concerns over the spread of invasive plants along the Bikeway and a passion for increasing native plantings and attending to landscaping.
- Safety issues that have resulted when young children, who are less experienced with biking, use the Bikeway, and how separation of users or increased path user guidance could improve safety for all users.
- A desire for additional amenities and requests for improvements at specific locations, including intersections and access points.
- A vision of the Bikeway as a key component of the Town's sustainability goals and the fight against climate change; as such, the Bikeway is envisioned as one thoroughfare of a larger low-stress biking and walking network

² The survey was conducted during the COVID-19 pandemic. Comparisons of AM peak count data between 2019 and 2020 suggest that use of the Bikeway for home to work commuting may have been significantly reduced due to the pandemic.



The Minuteman Bikeway in Arlington will be a safe, pleasant, and low-stress corridor for active transportation and recreation that is accessible and comfortable for all ages and abilities.



Chapter 3 POLICY

INTRODUCTION

This section documents current policies and policy discussions relevant to the Bikeway, two case studies from other communities with similar path or greenway facilities, and identifies issues and opportunities for improvement.

MANAGING SPEED

Conflicts between users on the Bikeway have increased as the Bikeway has grown in popularity. Often, these conflicts are attributed to the speed differential between people walking and biking. This section provides an overview of policies that could be used to manage speed and speed disparities between users and discusses the benefits and disadvantages of each. Design approaches that may aid in reducing speed differentials are discussed in Chapter 5.

Non-Regulatory Speed Limits

In 2019, the Lexington Bicycle Advisory Committee (LBAC) proposed the installation of a non-regulatory speed limit of 15 mph on the Bikeway. This speed limit would not be enforceable, but rather send a clear message to users about the expected use of the Bikeway. Based on a review of national, state, and local examples, as well as best practices in trail safety, the Arlington Department of Planning and Community Development (DPCD) identified several benefits and disadvantages of such a policy.³ These are summarized below.



Average biking
speed is around
12 mph

Benefits

- Can encourage users to travel more slowly via messaging
- Defines what speeds are considered “too high”
- Potentially reduces conflicts and the severity of collisions when they do occur
- Allows most bicyclists to continue traveling at their current speed (typically below 15 mph)
- Requires minimal investment (signage)

Disadvantages

- Limit is unenforceable due to Bikeway not being considered a “public way”
 - If it were to be enforceable, this could have resource limitations and equity implications
- Majority of bicyclists do not have speedometers and/or cannot judge their speed accurately
- Could deter commuter cyclists and recreational riders, thereby counteracting climate goals
- Data to support a speed limit is limited
- Differing policies between Arlington, Lexington, and Bedford could cause confusion
- Speed is just one factor of conflicts between users

³ <https://www.arlingtonma.gov/home/showdocument?id=56160&t=637552230921300781#:~:text=LBAC%20brought%20the%20issue%20of,at%2015%20miles%20per%20hour.>

As a result of this review, the DPCD recommended that a speed limit on the Minuteman Bikeway was not appropriate at the time. Since the review by the DPCD, no compelling research has arisen supporting speed limits on bikeways. In addition, the feedback and concerns received through the user survey and public meetings confirmed that speeding is one of several issues that may be better addressed through setting a target speed and managing user expectations and etiquette (see below).

RECOMMENDATION

Establish a target speed for the Bikeway or for specific sections of the Bikeway. ⁴ The target speed represents the highest operating speed at which users should ideally travel on the Bikeway and differs from a speed limit in that it is not enforceable and is communicated as path etiquette. Explore opportunities to creatively inform path users of their travel speed and create an expectation of slow and safe use of the Minuteman Bikeway. See also User Etiquette.

E-Bikes and Electric Mobility Devices

Since the opening of the Bikeway, people riding electric bicycles (e-bikes), electric scooters, and using other electric mobility devices have joined the fleet of more traditional bicyclists and pedestrians. These electric modes appeal to many users, including commuters, parents riding with children in tow, and people with limited physical ability. These devices also play an important role in encouraging people to shift from vehicle trips by lowering many of the common barriers to cycling.

60% of survey respondents believed responsible and safe use of electric bikes and scooters is important or very important.

While e-bikes have grown tremendously in popularity and advanced in design over the past several years, state legislation around the use of these devices has not changed accordingly. The current laws regarding “motorized bicycles” in Massachusetts were written with vehicles like mopeds and other motorized scooters in mind and do not account for vehicles that require pedaling to engage the motor. This has led to confusion and ambiguity in where these devices are allowed.

Many states have begun to clarify their definitions and regulations for operating e-bikes to reflect the federal definition of “low-speed electric bicycle” and to separate them into three classes based on top speed and whether pedaling is required to engage the motorized assistance:

- **Class 1:** The motor only engages when the rider is pedaling and stops assisting when the bicycle reaches 20 mph.
- **Class 2:** The motor can be engaged without pedaling and stops assisting when the bicycle reaches 20 mph.
- **Class 3:** The motor only engages when the rider is pedaling and stops assisting when the bicycle reaches 28 mph.

⁴ MassDOT’s Project Development and Design Guide recommends a design speed of 20 mph when engineering horizontal and vertical layout. In contexts where interactions between people walking and riding bikes are frequent, a design speed in the range of 10-15 mph is appropriate. A 2008 study using GPS found that half of trips for people biking fell between 9 and 13 mph (Dill, J. and J. Gliebe. *Understanding and Measuring Bicycling Behavior: A Focus on Travel Time and Route Choice*. OTREC-RR-08-03. 2008). A target speed of 15 mph would allow most riders to continue as usual.

In March 2021, legislation in both the MA House and MA Senate related to electric bicycle definitions and regulations was referred to the committee on Transportation.⁵ Advocates are supportive of these definitions and of allowing cities and towns to retain their right to restrict, regulate, or prohibit the use of e-bikes on certain paths. In the absence of local ordinances, modified state legislation would automatically allow slower e-bikes (Class 1 and 2) on paths and trails.

There are several benefits and disadvantages to consider when explicitly allowing e-bikes on trails:

Benefits

- Allows people with physical limitations and seniors to access recreational and transportation opportunities
- Makes riding longer distances more attractive to more people
- Removes many barriers to cycling (elevation gain, perspiration, ability to carry heavy loads or children)
- Helps to achieve sustainability and public health goals by shifting vehicle trips and encouraging physical activity

Disadvantages

- May change the experience for people seeking out off-road facilities
- May contribute to greater speed differentials, and therefore more conflicts. However, it should be noted that people riding traditional bicycles can reach the top speeds of Class 1 and 2 Bicycles (20 mph) and the same user etiquette expectations apply to all path users.
- Concern that allowing e-bikes is a “slippery slope” and could lead to future problems managing path uses

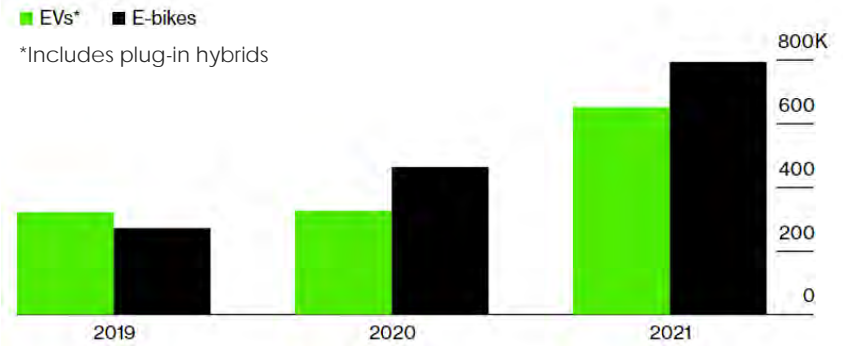


Figure 18. E-bikes are gaining in popularity. E-bike imports have been surpassing electric cars in recent years. (Bloomberg)

Today, the use of e-bikes and other electric mobility devices is not enforced on the Bikeway. If e-bikes were to be explicitly *prohibited*, it is important to note several considerations. Due to the fact that e-bike design and battery technology has advanced considerably, it can be difficult to

⁵ 192nd Session, [H.3457](#) and [S.2309](#)

distinguish between e-bikes and traditional bicycles, or between e-bikes of different classes. Enforcing restrictions would be difficult and could have equity implications or discriminatory impacts.

Active transportation advocacy organizations, including the Association of Pedestrian and Bicycle Professionals, advocate for passing model e-bike legislation and acknowledge the context-sensitive nature of regulating e-bike use on trails.⁶ These organizations discuss how both traditional bicyclists and e-bike users have the potential to cause speed-related user conflicts. While true motorized vehicles, such as mopeds or snowmobiles, have no place on shared use paths, regulations of vehicles with motors should not automatically prohibit the use of e-bikes. The Minuteman Bikeway plays a crucial regional transportation role, and the benefits of encouraging a wider diversity of riders through new technology should be carefully weighed against the disadvantages.

Case Study: E-Bikes on Seattle Parks and Recreation Trails

In June 2018, Washington State passed a law allowing Class I and II e-bikes on multi-use trails, unless local regulations precluded use.⁷ At the time, Seattle Parks and Recreation (SPR) prohibited the use of “motorized vehicles” on shared trails. As a proactive measure, SPR began a Multi-Use Trail Pilot program in August in which they began to allow Class I and II e-bikes and in which a new 15 mph speed limit was set for all trail users. SPR partnered with the Seattle Department of Transportation (SDOT) to install signs and educate users on proper trail etiquette. Upon instituting this pilot policy, SPR staff performed trail observations and gathered survey data to understand users’ opinions about the use of new technologies on multi-use trails in Seattle.

SPR found that on average, e-bikes and pedal bikes traveled at similar speeds...

Through this research, which included 1,400 survey responses and observations of 9,500 trail users, SPR found that on average, e-bikes and pedal bikes traveled at similar speeds on their trails (14.8 and 14.9 mph, respectively).⁸ This differential increased slightly when isolating the data to private bikes only (not part of a bike share system). While pedal bikes were the most common mode observed on the trails, devices like e-scooters and e-skateboards appeared to be increasing in popularity. Survey respondents were supportive of allowing e-bikes and limiting the speed of all users. Regulatory consistency, accessibility, and safety were top concerns.

In August 2020, the pilot concluded and a new Multi-Use Trail Policy was officially enacted. The policy maintained the e-bike allowance and 15 mph speed limit. In addition, it clarified roles and responsibilities among other local trail owners to ensure consistency and alignment between use policies.⁹ During the pilot program, SDOT’s bike share system was expanded to include e-scooters. Therefore, the policy incorporated broad language related to power and speed limitations, rather than to a specific type of electric vehicle. This allowed SPR to be flexible with its guidance, knowing that electric mobility devices are fast-evolving and that safe and fair trail use is the ultimate goal.

RECOMMENDATION

As legislation proceeds at the state level, the Town of Arlington has an opportunity to lead this conversation with thoughtful communication about user expectations and specific guidance on the types of electric and motorized vehicles allowed on the Bikeway. The Bikeway Brochure map, maintained by the Arlington Bicycle Advisory Committee, currently stipulates that motorized wheelchairs are allowed on the Bikeway and that electric vehicle riders (e-bike and e-scooter riders) should ride responsibly and pass cautiously.¹⁰ Expanding upon these guidelines and dedicating resources to educate users on expected etiquette will promote the safe use of these devices while increasing the user population that is able to access the Bikeway.

MANAGING BIKEWAY DEMAND

This section summarizes existing and proposed policies for managing user volumes on the Bikeway.

Alternate Routes

Similar to a public roadway, the Bikeway experiences peak hours of travel. On weekdays, volumes typically peak during commuting hours and school dismissal, while on weekends, peak hours vary. Conflicts between users may be more common during these peak periods when the path is crowded and users of all ages and modes are using the path together. In support of the vision for a Bikeway that is “accessible and comfortable to users of all ages and abilities,” use should not be restricted as a method to manage peak hour volumes. The expansion of Arlington’s broader low-stress bicycle network, particularly along Massachusetts Avenue, will have the greatest impact on diluting crowding on the Bikeway. Providing low-stress parallel routes will give bicyclists

45% of survey respondents believed the Bikeway did not provide space for all modes and users to operate comfortably

additional options to reach the same destinations during peak hours. In some cases, on-street facilities will also facilitate higher speeds for those bicyclists wishing to travel faster than other path users.

RECOMMENDATION

Prioritize building the recommended bicycle network proposed in *Connect Arlington* (Figure 19). Consider quick-build treatments where possible and provide wayfinding to and from the Bikeway.

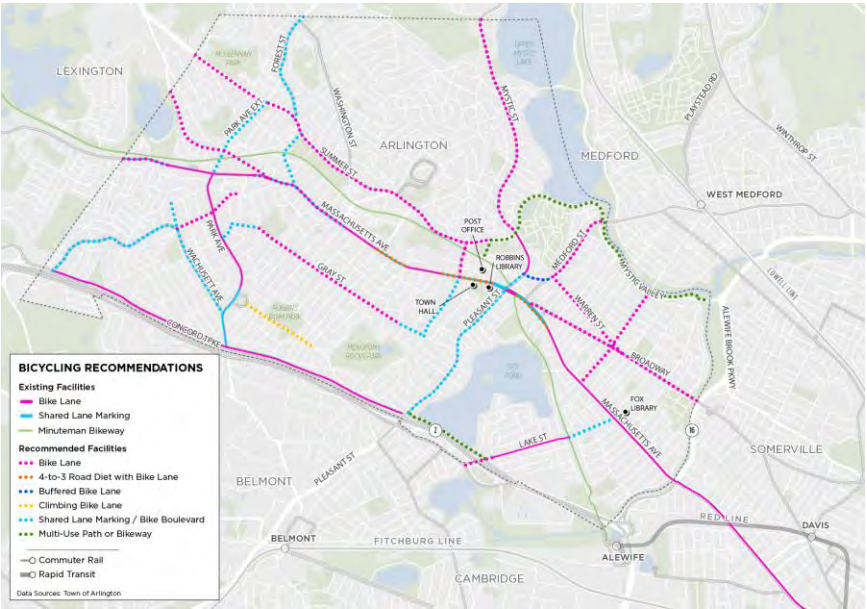


Figure 19. Recommended Bicycle Network (Connect Arlington)

⁶ https://www.apbp.org/assets/docs/rev_apbp_policy_statement_on.pdf
⁷ <https://lawfilesexternal.wa.gov/biennium/2017-18/Pdf/Bills/Session%20Laws/Senate/6434-S.SL.pdf>
⁸ <https://parkways.seattle.gov/2019/08/27/moving-forward-with-multi-use-trails/>
⁹ <http://www.seattle.gov/Documents/Departments/ParksAndRecreation/PoliciesPlanning/Multi-Use%20Trail%20Policy.pdf>

¹⁰ <http://minutemanbikeway.org/home/about/>

User Etiquette

This section summarizes existing guidance, options for managing space on the Bikeway, and recommendations for communicating expected user etiquette. Concerns about user etiquette were raised repeatedly throughout the public engagement process. These concerns typically related to the user behavior of children, people walking dogs, and faster-moving cyclists, such as commuters or people riding for exercise. Many users also expressed concerns about the inconsistent use of bicycle lights.

User etiquette signs are intermittently posted along the Arlington section and have limited effectiveness in capturing users' attention (see **Figure 20**).

Existing Guidance

The Minuteman Bikeway website features a “Guidelines” page outlining etiquette for all path users.¹¹ These guidelines are divided into five categories: General, Bicycling, Walking/Jogging, In-Line Skating, and Common Courtesy. Many of these are repeated on the Bikeway Brochure Map, also published through the Minuteman Bikeway website.¹² However, it is notable that several guidelines differ between these two pages, specifically when it comes to helmet use and the use of electric bikes and motorized wheelchairs.

The general expected etiquette among these three resources is as follows:

- All users are to keep right, except to pass
- Pass on the left, only when safe, and give an audible warning
- Look carefully before entering or crossing the Bikeway
- Users must stop at all stop signs and move off the Bikeway if stopping otherwise
- All users must yield to emergency and maintenance vehicles
- Ride at a safe speed and slow down when the Bikeway is crowded
- Ride, walk, or jog single file, unless during a low use period, when two-abreast is acceptable
- Bicyclists and skaters should wear safety helmets and helmets are required for children under a certain age
- Owners must pick up after their pets and keep them on a short leash
- Be visible after dark by using bicycle lights and reflectors or reflective clothing

While these principles are common among many shared use paths nationally, depending on a user's familiarity with the Bikeway and their exposure to these resources, they may not be familiar with these expectations. Signs like the one shown here are not legible to passing path users, limiting their effectiveness. More information on effective communication of bikeway use policies is covered in Communication of User Etiquette.

46% of survey respondents ranked path user etiquette as poor or very poor.



Figure 20. Existing etiquette sign

RECOMMENDATION

In line with the vision for the Minuteman Bikeway as a resource for all, policies with the potential to discourage or restrict use should be avoided. In general, equipment requirements for path users such as helmets for adults or personal lights on bikes are not recommended as these requirements and enforcement can have equity implications and discourage use.

In acknowledgement of the friction that can arise between different user types, more specific etiquette guidance for dog walkers and people traveling with children may be merited, such as:

- Keep pets on a short leash and walk pets on the right-hand shoulder
- Keep children close and away from oncoming or passing users
- Take extra care when passing children, the elderly, or those with limited mobility

For path users who verbalize their audible signal when passing, communicating a set word or phrase could help to create consistency and avoid situations where those being passed are startled into turning into the path of the passing user. The expression “On your left” has been the source of some contention as it suggests having to quickly understand where the passing user is coming from. An expression such as “Passing” – which should always be done on the left – could simplify these interactions.

A target speed may either be explicitly included in user guidance or encouraged through broader messaging (e.g., “slow is the way to go”).

Communication of User Etiquette

Expectations of user etiquette cannot be implied. They must be communicated to users clearly, regularly, and through a variety of methods. While published guidelines on the Minuteman website can be an important resource, posted signs on the Bikeway itself will be the most impactful way to communicate the following:

- Permitted uses
- Where path users of different modes should be within the path envelope



Figure 21. Clockwise from top: Etiquette signs from Hong Kong, HK, Atlanta, GA, and Town of Cary, NC

¹¹ <http://minutemanbikeway.org/services/>
¹² <http://minutemanbikeway.org/home/about/>

- Passing etiquette
- Expectations at intersections
- Guidance for pets and children on the path
- Stopping etiquette

The existing signs generally communicate these expectations clearly but are not always legible to passing users and their sporadic placement leads to a lack of consistent messaging. There should also be an effort to ensure that all users are able to receive this information, including users with visual impairments or limited English proficiency.

User etiquette can also be communicated via messaging campaigns, social media, and public events. These methods can leave a lasting impact on path users by opening a direct line of communication with the Town and by providing an opportunity to have conversations about expected etiquette.

RECOMMENDATION

Upon confirming the desired messaging, signs outlining user etiquette should be posted at all major access points to the Bikeway, at intersections with roadways, and at the beginning and end of the Arlington section. The use of simple graphics and larger text should be incorporated. The Town should also take advantage of existing communication channels and public events on the Bikeway to consistently communicate expected user behavior. Close coordination with Lexington and Bedford will help ensure that user expectations are consistent along the length of the Bikeway. One way to engage the community and manage town staff capacity could be to host a competition for creative etiquette slogans and graphics that could be incorporated into signage.

Hours of Operation

Prior to Fall 2020, the official operating hours of the Bikeway were the same as all parks in Arlington: 5:00 AM – 9:00 PM. At a Special Town Meeting in Fall 2020, a motion passed which removed all hours of operation from the Bikeway, effectively making the path open at all times. This policy benefits commuters connecting to transit at Alewife and brings the Arlington section of the Bikeway in line with sections in bordering towns, including Cambridge. Expanding the operating hours of the Bikeway also has equity benefits by accommodating work schedules that are outside the traditional 9-5 window.

RECOMMENDATION

Maintain the current hours of operation while clarifying instances in which the Bikeway may require temporary closure (“special use”), such as during maintenance. Maintain the policy that the Bikeway is open to all users at all times. It would be infeasible and undesirable to restrict use to certain user groups at different times of day. Because the Bikeway is available for use at all times of day and year, lighting upgrades and maintenance such as snow and ice clearing are of particular importance.

JURISDICTIONS

Coordination with MBTA

A key challenge faced along the Minuteman Bikeway is the division of the corridor between Town and MBTA control. The Town is limited in its ability to widen the Bikeway footprint, add access points, or conduct certain maintenance without approval from the MTBA. The contact point for such discussions is the Real Estate group.

Considering that the agreement with the MBTA began several decades ago, all parties would benefit from the establishment of a renewed working relationship and regular check-ins. By communicating regularly with the MBTA Real Estate group and inviting MBTA representatives to attend relevant community meetings or working sessions, the Town of Arlington would be able to better communicate the needs of Arlington residents when it comes to the Bikeway. This would also allow the MBTA to communicate their interests and concerns surrounding the rail corridor. For specific requests, such as the addition of new access points or the clearing of invasives, the Town could prepare community-supported letters clearly documenting the benefits and costs of these efforts.

The establishment of an open line of communication between Town employees and the MBTA and a clear definition of needs from both sides could support collaboration between the MBTA working together with Arlington to make improvements to the Bikeway within their purview.

RECOMMENDATION

Establish a regular working relationship with the MBTA Real Estate Group and invite them to become an active stakeholder and steward of the Bikeway.

Coordination with Partner Municipalities

The Bikeway is a multijurisdictional asset. Therefore, close coordination and the alignment of policies with bordering municipalities will benefit path users.

RECOMMENDATION

Coordinate with Cambridge, Lexington, and Bedford to identify other MBTA agreements and past projects to shed light on policies and procedures, with particular attention to the maintenance responsibility of the bridge over Alewife Brook. Consider establishing a Memorandum of Understanding (MOU) with Cambridge to reach a shared approach for maintenance of the Bikeway near Alewife so that each community’s efforts support the other and do not come into conflict. Continue ongoing coordination with Lexington and Bedford to maximize consistency between Bikeway policies.

Coordination with Abutters

Along the Bikeway, there are many informal access points leading to private property. These access points are not clearly defined, which can lead to confusion. Many of these informal access points do not have a graded transition from the Bikeway and are unpaved, creating accessibility challenges or unsafe conditions for some path users, especially where erosion has created a difference in grade between the Bikeway and adjacent unpaved paths.

RECOMMENDATION

For private ways that provide public access, consider distinct branding to distinguish between public and private access points. Also consider adding path turn-offs using stabilized aggregate or other soft-surface treatments to create a more level transition within the Bikeway right-of-way. This will improve access and safety while avoiding the implication that these turn-offs are part of the main Bikeway. For private access point, provide design guidance to developers or private entities to ensure consistency at access points. See also Trailhead and Wayside recommendations.



Chapter 4 MAINTENANCE

EXISTING PROCEDURES

There is currently no formal maintenance policy or program in place for the Bikeway. The Town Manager oversees the general maintenance of the Bikeway and approves changes on the property while the Arlington Department of Public Works (DPW) oversees tasks such as mowing, patching asphalt, and pruning vegetation on an as-needed basis. During and after snow storms, DPW plows the Bikeway similarly to roadways in the town. All maintenance activities on the Bikeway are funded through the DPW budget. As mentioned in previous chapters, any maintenance beyond the immediate path envelope technically requires coordination with the MBTA Real Estate Division, which does not currently perform any routine maintenance on the corridor. The development of the following short- and long-term maintenance plans should consider this relationship and coordination with the towns of Lexington and Bedford.

DPW has many related maintenance plans and programs in place for the town's public roadways, including a semi-annual town-wide sweeping program,¹³ a tree management plan,¹⁴ and a traffic markings painting schedule.¹⁵ These roadway maintenance programs are proactive and set up to reoccur on a regular basis. Based on conversations with the Department of Public Works, these plans do not typically include the Bikeway in maintenance schedules or programs. The exclusion of the Bikeway from these reoccurring programs is a result of a variety of hurdles, the largest being the difficulty of conducting temporary closures and detours on the path. While DPW has procedures in place for notifying path users of closures and preparing detours, there are several sections of the Bikeway that are very difficult to close, even for a short time. Additional hurdles are related to maintenance equipment; for example, the Town's street sweeping equipment is too large to easily access sections of the Bikeway, a condition aggravated by pinch points at the bridges.

Arlington also hosts a "Request/Answer Center" on the town website, which allows people to submit questions or requests falling under a variety of categories. One such category is "Parks, Playgrounds, Bike Path" which asks people to share concerns or report vandalism related to these areas. The submission form requires users to select a specific park field or facility ("Bikepath" is an option) and to provide details regarding their concern. This site also includes categories for questions or requests related to public works, snow and ice, street and road maintenance, street signs, and trees. Requests submitted through this site are automatically dispatched to the appropriate contacts within DPW and other town departments.

Request Type	Description
Ask a Question	Did you browse the FAQs and not find your answer? Ask your question here.
Parks, Playgrounds, Bike Path	Share a concern about a park, playground, field or bike path. Report vandalism.
Recreation Facility Concern	Share a concern about the Ed Burns Arena, Spray Pool, or Reservoir Beach.

Figure 22. Arlington's "Request/Answer Center"

¹⁴ See [Public Works Street Sweeping Page](#) and [Street Sweeping FAQs](#)

¹⁵ [Arlington Tree Management Plan \(2018\)](#)

¹⁵ [Traffic Markings Painting Schedule](#)

Existing maintenance related to the Bikeway tends to be reactionary, or complaint-based. While both proactive and reactive programs are valid approaches, the town could save money and time by pairing this reactive approach with a more proactive overarching Bikeway maintenance plan. A proactive approach could be more cost-effective because regular, less-intensive maintenance tends to be less expensive and the Bikeway could be integrated with the existing roadway maintenance programs as an additional right of way.

These maintenance procedures are in line with that of Lexington and Bedford, which also place the majority of maintenance responsibility on their respective Departments of Public Works with help from local volunteers. Lexington also raises private funds to organize snow removal on the Bikeway through a private contractor.

LONG-TERM RECOMMENDATIONS

Develop Maintenance Program

The development of a written Bikeway Maintenance Program will save time and money while contributing to a better experience for path users. The program will establish a time frame for regular maintenance items and provide guidelines for annual (or seasonal) inspections of the Bikeway to anticipate maintenance issues before they become hazards to users. Similar to existing roadway maintenance programs, it will establish roles and responsibilities and can lean on community partners to assist Town staff with certain items. The program will likely build from many existing roadway maintenance programs and will require dedicated attention from the Department of Public Works. Funding for ongoing maintenance may be met through a variety of sources, including continued allocations from the annual Public Works Administration budget and financial plan, state or federal funding, community donations, or non-profit organizations. Maintenance operations needs that should be included in the program, the related existing maintenance programs, and the potential responsible departments are listed in **Table 6** below. Each of these needs will require the scheduling of annual or seasonal inspections, the clear determination of the responsible entity, and a prioritization process. Depending on the procedures of the existing programs, the Town may need to purchase additional equipment, allocate additional funding or resources, or increase the frequency of maintenance when formally including the Bikeway. Maintenance performed in resource areas along the Bikeway will require careful coordination with the Conservation Commission.

Table 6. Maintenance Operations Examples

Maintenance Need	Existing Related Maintenance Programs	Responsible Department
Sweeping (leaves and debris)	Spring town-wide sweeping program	Public Works (Highway Department)
Snow and ice clearing	Standard Snow Removal Procedure	Public Works (Highway Department)
Catch basin cleaning	Fall town-wide sweeping program; Adopt a Catch Basin program	Public Works (Highway Department)
Edge maintenance (mowing and trimming)	Seasonal edge mowing	Public Works (Parks and Fields Department)
Invasives management	N/A	Public Works (Parks and Fields Department)
Tree maintenance and annual inspection	Arlington Tree Management Plan; Preventative tree removal	Public Works (Trees Department)
Pothole patching	Spring town-wide sweeping and street maintenance program	Public Works (Highway Department)
Pavement marking and striping refreshing	Spring town-wide sweeping and street maintenance program	Public Works (Highway Department)
Artwork maintenance and management	N/A	Arlington Commission for Arts and Culture

While the town will designate an official responsible department for each maintenance need, volunteer recruitment and coordination can play an important role in accomplishing ongoing maintenance tasks. There are already active volunteer organizations related or adjacent to the Bikeway and existing volunteer maintenance programs in the town, such as the “Adopt a Catch Basin” program. Engagement with volunteers can help lessen the burden on the Department of Public Works and ensure that ongoing maintenance issues are proactively tracked and addressed.

Additional maintenance needs will likely arise outside of scheduled inspections, so the establishment of a reporting system and the creation of a formal role tasked with tracking and coordinating maintenance needs will ensure that emerging maintenance issues do not become hazardous to path users. This system could be housed under the existing “Request/Answer Center” or developed separately, under either the Department of Public Works or Planning and Community Development.

To the extent possible, capital maintenance projects should be included in the Bikeway Maintenance Program to formalize regular investment and inform the annual Capital Improvement Program and the Capital Planning Committee¹⁶. Examples of capital maintenance projects are included in **Table 7** below.

¹⁶ <https://www.arlingtonma.gov/town-governance/boards-and-committees/capital-planning-committee>

Table 7. Maintenance Capital Program Examples

Maintenance Need	Existing Maintenance Program	Responsible Department
Repaving and Roadway Reconstruction	Annual Roadway Rehabilitation Project	Public Works (Engineering Department)
Bridge repair	N/A	Public Works (Engineering Department)
Reconstruction of non-compliant access points	Handicap Ramp Program	Planning & Community Development/ Public Works (Engineering Department)

The identification of locations in need of more extensive capital improvements will likely occur during annual or seasonal inspections. In some cases, additional site inspections, such as after large snowstorms or weather events, will be necessary to reveal certain maintenance needs, such as ponding and icing.

Case Study – Farmington Canal Heritage Trail

The Farmington Canal Heritage Trail is a partially completed rail-trail that runs for 80 miles from New Haven, CT to Northampton, MA. In 1992, as construction was underway, the Farmington Valley Trails Council (FVTC) was formed as a non-profit organization to support the development of the trail. Today, the FVTC serves an important advocacy and organizational role, providing coordination between the trailside communities and funding assistance for trail improvements

While the Connecticut Department of Energy and Environmental Protection built and owns the Farmington trails, local municipalities are responsible for maintaining their sections of the trail. Although the FVTC is not directly involved in maintenance activities, it assists municipalities and local public works departments by providing information on best practices for maintenance activities, helping secure grants for trail maintenance, and making recommendations on new designs and repairs. In addition, the FVTC coordinates volunteer trail improvements, including fundraisers, “friends of” groups, clean-up events, and co-sponsorships with other charitable organizations.

Not only does the FVTC help to ensure consistency in upkeep and maintenance practices across the localities, it also fosters a sense of community and ownership over the trails. As of 2019, the FVTC had over 800 paying members, whose funds contributed to maintenance, construction, and amenities.¹⁷ The FVTC also maintains a website offering updates on new trail construction, safety, closures, and municipal decisions along the trail.¹⁸ To facilitate communication and trail maintenance efforts, the FVTC board meets on a monthly basis in addition to helping coordinate larger community events throughout the year.

While the Minuteman Bikeway is of a different scale than the Farmington Canal Heritage Trail, the Tri-Town Bicycle Advisory Committee could play a similar advisory and coordinating role between the towns of Arlington, Lexington, and Bedford. By serving as an overarching advisory organization, the Committee could assist these municipalities in fortifying their existing maintenance and volunteer coordination efforts, as well as facilitate communication and consistency between the three areas.

¹⁷ https://www.railstotrails.org/resourcehandler.ashx?name=trail-management-best-practices-case-studies-in-creating-successful-community-trails&id=24001&fileName=CDTC_TrailsMngmtBestPractice-1.pdf

¹⁸ <https://fchtrail.org/>

Management of Invasive Plant Species



Figure 23. Japanese Knotweed along the Bikeway

Invasive plants, including Japanese Knotweed, garlic mustard, and black swallowwort, are contributing to certain problems along the Bikeway, including reduced sight lines, ineffective drainage, the driving out of native plants, and the collapsing of local ecosystems. The management of invasive plants along the Bikeway is complicated by the MBTA's authority over the land on either side of the paved path. The Town is well aware of the issue of invasive plants and has provided guidance and training for identifying invasive species.¹⁹ Many path users are also familiar with the location of invasives along the Bikeway, as evidenced by feedback received during the public survey and public engagement process.

The maintenance of invasive plants along the Bikeway will be best addressed through the establishment of a joint maintenance plan between the Town and the MBTA Real Estate Division for the ongoing management of invasives. This joint plan should accomplish the following:

- Establish more frequent and consistent edge mowing.
- Establish areas along the Bikeway that are priorities for clearing in the short-term and maintaining in the longer-term.
 - Collapsed ecosystems are not generally a priority due to the cost and time needed to restore natural habitat.
- Develop a native planting plan, which identifies areas that could benefit from native plantings, recommends specific native species to plant, and establishes “no-mow” areas.
- Establish best practices for adding new plantings and maintaining existing ones.
- Determine roles and responsibilities related to maintenance, including the development of a volunteer landscaping program.

¹⁹ [Arlington Land Stewards: Invasive Plant Management Guide](#)

Case Study – Norwottuck Rail Trail

The Norwottuck rail trail is an 11-mile paved trail that runs along the former Boston and Maine railroad through Belchertown, Amherst, Hadley, and Northampton, MA. The trail is owned by the Department of Conservation and Recreation (DCR) and first opened in 1993, creating a popular recreational and transportation corridor for many residents and students of western Massachusetts. In the early 2000s, the trail began experiencing several maintenance and capacity issues. In particular, the original asphalt pavement was deteriorating, roots of the bordering Black locust trees were contributing to an uneven trail surface, and the trail was too narrow at just over eight feet wide.

The Norwottuck Rail Trail Advisory Committee, which was made up of two representatives from each town the trail passes through, began working with DCR to repave small sections and install root barriers in specific areas. In parallel, DCR began working with a consultant to prepare plans for a full redesign. This was spearheaded by Congressman John W. Olver, who secured funding for the trail's reconstruction at the urging of the Advisory Committee. In 2009, this process reached a standstill over concerns from conservationists that widening the trail would require the removal of too many trees and threaten the protected wetlands much of the trail runs through.



Figure 24. The Norwottuck Rail Trail ([Paul Cooper](#))

Following the addition of expanded provisions for beaver protection and vegetation replacement and enhancement to the design plans, the rehabilitation effort was able to move forward, with reconstruction beginning in 2013. In total, 8.5 miles of the trail were repaved and widened to 10 feet, where possible. The project also involved resurfacing several bridges, upgrading signing and pavement markings at crossings, installing waysides, improving parking lots, removing select trees and vegetation to improve sight lines, cleaning and draining swales, and installing erosion control measures. Construction was completed in 2015.

SHORT-TERM RECOMMENDATIONS

Paving

While sections of the Bikeway have been rehabilitated over the past two decades, the Bikeway has not been fully repaved since the early 2000s, when the installation of fiber optics cables resulted in a full repaving of the path. In the short-term, the town should identify and repair those sections of the Bikeway suffering from the most severe pavement damage, including cracking, potholes, and heaves. Remaining damaged sections can be incorporated into and prioritized as part of the longer-term Bikeway Maintenance Program. As sections of the Bikeway are repaved, root barriers should be used when possible, to extend the lifetime of the new pavement.

Vegetation

Before developing a long-term maintenance program for vegetation management, the town should address those locations where vegetation crowds sight lights at access points and narrows the effective width of the path. The cutting back or mowing of vegetation at these locations will have the greatest short-term impact on safety and path level of service.

Bridges

The majority of bridge maintenance will need be incorporated into long-term maintenance and capital improvement plans. In the short term, the removal of the bollard bases and the installation of temporary ramps on the Alewife Brook bridge would improve accessibility and safety. Additional inspection of existing bridges and exploration of widening can occur in the short-term as well.

Drainage

Areas which commonly experience pooling of standing water should be identified and improved in the short-term. In some areas drainage issues may be related to vegetation. Following this, regular drainage inspection and improvement can be integrated with the Bikeway Maintenance Plan.

MAINTENANCE COSTS

Maintenance costs for trails can vary widely depending on climate, surface type, and level of volunteer engagement. The Rails-To-Trails Conservancy offers a variety of resources for estimating trail maintenance costs across a variety of contexts. **Table 8** provides an overview of routine maintenance costs per mile for six example rail trails. These benchmarks can provide an estimation of the financial resources that may be required to maintain the Bikeway in the future, as volumes, volunteer engagement, and amenities evolve.

Table 8. Routine Maintenance Costs per Mile

							
	Schuylkill Banks	Lamoille Valley Rail Trail	MoPac Trail-West	Armstrong Trail	Sammamish River Trail	Panhandle Pathway	
Location	Philadelphia, Pennsylvania	Northern Vermont	Lincoln, Nebraska	Western Pennsylvania	Seattle, Washington	Northern Indiana	
Trail Surface	Asphalt-Urban	Stone Dust-Rural	Concrete-Suburban	Stone Dust-Rural	Asphalt-Suburban	Asphalt-Rural	
Visitation	1,726,215 user trips in 2019	Busiest section had 53,686 trips in 2019	N/A	69% increase from 2019 to 2020	2018: 572,832 Total (278,735 Peds, 294,097 Bikes)	N/A	
Primary Maintenance	Nonprofit and city	Nonprofit staff	Park district crew	Nonprofit staffers and volunteers	County staff	All volunteer	
Length Studied	1 mile	34 miles	5 miles	36 miles	10 miles	23 miles	
Total Cost Per Mile	\$102,322	\$3,610	\$679	\$2,377	\$7,819	\$967	
Volunteer Hours	1,228	460	32	1,908	0	687	
Surface and Structures	Trail located between active tracks and river	Averages one bridge and seven culverts per mile	Six bridges inspected on a five-year rotation	2468-foot tunnel and seven bridges	No bridges	One 230-foot bridge	
Vegetation	Extensive grass areas and plantings	Snowmobile clubs remove large trees	No tree canopy reduces costs significantly	Emerging high-tree canopy over trail	Trenching not allowed per archeology	Controls root damage by trenching	
Level of Amenities	Very high and very rich level of design	Mid, with signage at 200+ road crossings	Low	Low	High, with one fixed toilet and three temporary	Low	
Cleanliness and General Comments	Trash receptacles emptied daily, floods annually	Most significant impact is from beavers	Removes snow after 2 inches	"Pack it in, pack it out" policy	Has 18 trash receptacles at trail heads	Occasional dumping of tires/mattresses	

Source: [Rails-to-Trails Conservancy](#)



Chapter 5 DESIGN RECOMMENDATIONS

SIGNS AND WAYFINDING

Regulatory and Warning Signs

Warning and regulatory signs play an important role in guiding users, encouraging appropriate speeds, and facilitating safe crossings at intersections. These signs look similar to those seen on roadways but are often smaller and mounted at a lower height. Warning and regulatory signs along a shared use path like the Minuteman should be consistent with the guidelines in the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD) Part 9, especially at street crossings.²⁰ Currently, a variety of signs are installed along the Bikeway and not all applications meet MUTCD requirements. Establishing consistency in the application, location, and use of these signs will clarify expectations for proper use and improve the Bikeway experience.

Regulatory signs communicate how path users should operate and interact with other users while using the Bikeway. These include intersection control signs, such as “stop” and “yield,” as well as prohibitive signs, such as “No Motor Vehicles.” **Table 9** summarizes the most common regulatory signs applicable to the Bikeway.

Warning signs alert path users to upcoming changes in alignment, intersections with roadways or other paths, changes in path condition or width, blind curves, and low vertical clearance. Typically, warning signs call out conditions that require speed reduction and careful attention from path users to safely traverse the path. Advanced warning signs are often used to alert path users to upcoming conditions to allow for adequate perception and response time. **Table 10** summarizes the most common warning signs applicable to the Bikeway.

It is important to note that excessive sign applications can lead to lower compliance by path users. Regulatory and warning signs should be installed only as needed and spaced appropriately to decrease sign clutter.

RECOMMENDATION

Review and revise the existing regulatory and warning signs on the Bikeway such that the signing is consistent along the Arlington section, compliant with the MUTCD, and clear to all users. Reduce sign clutter by thinking critically about necessary signage and apply signs in strategic locations.

Table 9. Applicable Bikeway Regulatory Signs

Sign Image	Sign Name	Typical Application and Design Guidance
Corridor Regulatory Signs		
	SHARED-USE PATH RESTRICTION SIGN (R9-7)	<ul style="list-style-type: none">- Apply in conjunction with pavement markings to delineate pedestrian and bicycle user envelopes.- These signs supplement white striping separating users and should not be applied without clear separated spaces for people walking and biking
	KEEP RIGHT EXCEPT TO PASS (R4-16)	<ul style="list-style-type: none">- Apply regularly along the Bikeway, with additional applications at trailheads, access points, and following intersections.- These signs communicate the expectation that users keep right unless passing, which they should do with care.- Since bicyclists are typically traveling at higher speeds than pedestrians, they are expected to yield to the slower users until it is safe to pass them.
	SLOWER TRAFFIC KEEP RIGHT (R4-3)	
	PASS WITH CARE (R4-2)	
	YIELD TO PEDS (R9-6)	
	DO NOT PASS (R4-1)	
Intersection Regulatory Signs - Bikeway		
	STOP (R-1)	<ul style="list-style-type: none">- Apply at stop-controlled intersections between the Bikeway and an intersecting roadway.- Should be paired with a stop line.

	YIELD (R1-2)	<ul style="list-style-type: none">- Apply at yield-controlled intersections between the Bikeway and an intersecting roadway.- May also apply at access points to direct people entering the Bikeway to yield to existing traffic.- May be paired with yield pavement markings.
	NO MOTOR VEHICLES (R5-3)	<ul style="list-style-type: none">- Apply at intersections with roadways to communicate to drivers that motor vehicles are not permitted on the Bikeway (does not apply to electric bicycles)
	PUSH BUTTON FOR GREEN (R10-4)	<ul style="list-style-type: none">- Apply at crossings where path users are required to push a button to request green
	TO REQUEST GREEN WAIT ON SYMBOL (R10-22)	<ul style="list-style-type: none">- Apply at crossings where bicyclists are required to wait on the bicyclist symbol to request green
	PUSH BUTTON FOR GREEN LIGHT (R10-24)	<ul style="list-style-type: none">- Apply at crossings where bicyclists are required to push a button to request green
	BICYCLIST USE PED SIGNAL (R9-5)	<ul style="list-style-type: none">- Apply at crossings where bicyclists need to use the pedestrian signal
	BICYCLING SIGNAL (R10-10b)	<ul style="list-style-type: none">- Apply at crossings where a bicycle signal directs bicyclists
	LEFT/RIGHT TURN MAY USE TURN BOX (D11-20)	<ul style="list-style-type: none">- Apply at crossings with two-stage bicycle turn boxes

Table 9. Applicable Bikeway Regulatory Signs (continued)

Intersection Regulatory Signs - Roadway		
	YIELD HERE TO BICYCLES AND PEDESTRIANS (R1-5 ALT. B)	<ul style="list-style-type: none">- Apply at mid-block crossings where yield lines are provided ahead of a crosswalk across two or more traffic lanes traveling in the same direction. The sign and yield line denote the location for vehicles to yield to path users in the crossing.- These signs are not required if the crosswalk extends across a single lane of traffic in each direction and should not be used in locations where sign clutter is an issue.
	STOP HERE FOR BICYCLES AND PEDESTRIANS (R1-5B)	<ul style="list-style-type: none">- Apply at mid-block crossings where vehicle traffic is stop-controlled or required to stop for activated PHBs.
	TURNING VEHICLES YIELD TO BICYCLE AND PEDESTRIANS SIGN (R10-15 ALT.)	<ul style="list-style-type: none">- Apply at sidepath intersections to notify drivers taking permissive left- or right-turns of the requirement to yield to people biking at the crossing.- For left turns, the sign should be mounted on the far side of the intersection to improve visibility.

Table 10. Applicable Bikeway Warning Signs

Sign Image	Sign Name	Typical Application and Design Guidance
Corridor Warning Signs		
	CURVE (W1-2)	<ul style="list-style-type: none">- Apply at locations where the Bikeway curves significantly, necessitating a reduction in speed
	REVERSE CURVE (W1-4)	<ul style="list-style-type: none">- Apply in locations where the Bikeway has a reverse curve, requiring a reduction in speed
	NARROW BRIDGE (W5-2)	<ul style="list-style-type: none">- Apply at bridge crossings where the effective width of the Bikeway is reduced

	PATH NARROWS (W5-4A)	<ul style="list-style-type: none">- Apply at locations where the Bikeway narrows considerably
	BICYCLE SURFACE CONDITION, SLIPPERY WHEN WET (W8-10, W8-10P)	<ul style="list-style-type: none">- Apply at locations where the surface conditions are consistently hazardous and where bicyclists should take caution
Intersection Warning Signs - Bikeway		
	STOP AHEAD (W3-1)	<ul style="list-style-type: none">- Apply ahead of stop-controlled intersections between the Bikeway and an intersecting roadway- Apply at least 50 feet in advance of the intersection
	YIELD AHEAD (W3-2)	<ul style="list-style-type: none">- Apply ahead of yield-controlled intersections between the Bikeway and an intersecting roadway- Apply at least 50 feet in advance of the intersection
	SIGNAL AHEAD (W3-3)	<ul style="list-style-type: none">- Apply ahead of signalized intersections between the Bikeway and an intersecting roadway- Apply at least 50 feet in advance of the intersection
Intersection Warning Signs - Roadway		
	BICYCLE/PEDESTRIAN WARNING SIGN (W11-15)	<ul style="list-style-type: none">- Apply at uncontrolled mid-block crossings (i.e., where roadway users have priority) to alert drivers of approaching path users.- Can be combined with an RRFB.
	TRAIL CROSSING PLAQUE (W11-15p)	<ul style="list-style-type: none">- Apply at uncontrolled mid-block crossings as a supplemental plaque to BICYCLE/PEDESTRIAN WARNING (W11015).
	AHEAD PLAQUE (W16-9p)	<ul style="list-style-type: none">- Apply as an advanced warning to uncontrolled mid-block crossings as a supplemental plaque to BICYCLE/PEDESTRIAN WARNING (W11-15)

Wayfinding

Wayfinding helps people understanding where they are, and how to get to where they want to go. The goal of wayfinding design is to provide strong organizational and visual cues that facilitate user recognition and mental (cognitive) mapping of one's surroundings.

Clear wayfinding is intuitive, nonverbal, and should help users navigate various spaces in an efficient and enjoyable manner. Not only should it guide people along, to, and from the Bikeway, but it should also encourage discovery.

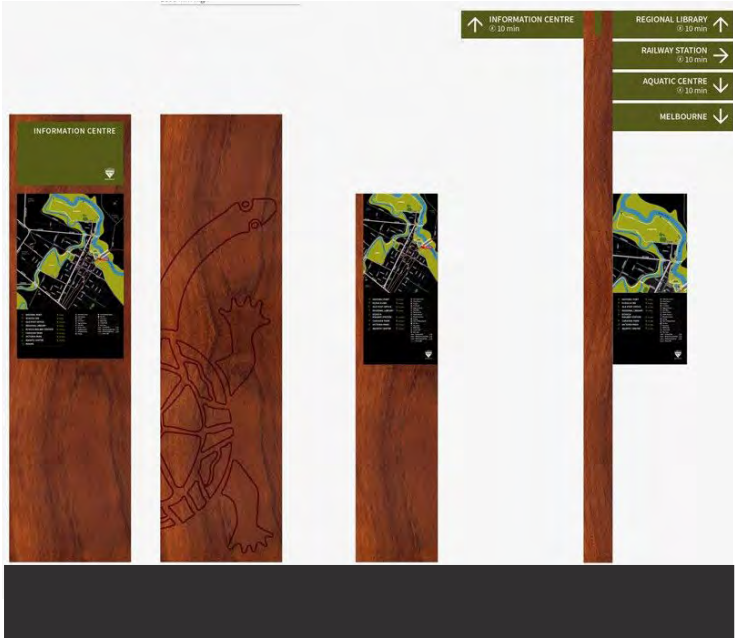
Types of Wayfinding

There are generally four major types of wayfinding design and signage including:

- **Identity and Orientation:** Allows you to figure out where you are relative to your destination.
- **Directional:** Tells you which way you need to go.
- **Informational:** Gives you supplemental information about the journey and/or destination.
- **Regulatory:** Tells you about rules and regulations.

Figure 25 shows examples of styles and massings for different types of wayfinding.

Figure 25. Examples of Wayfinding Signs



<https://rsmdesign.com/news/what-is-wayfinding-part-3-wayfinding-is-more-than-just-signage>

Wayfinding for the Bikeway

The Minuteman Bikeway has been in Arlington so long that people may take for granted the connections and opportunities that the path offers them for travel and recreation. This plan offers an opportunity to look at the greater context to consider how the Bikeway could be improved as both an experience and a physical asset.

Current Strengths

- Consistent path width and materials reinforce a recognizable route with the exception of the Massachusetts Avenue/Mystic Street crossing
- Easily recognizable logo (Minuteman Bikeman) offers a well established brand

Current Weaknesses

- Nondescript features
- Lack of identification at key access points
- Massachusetts Avenue/Mystic Street crossing interrupts the flow of the path and the expectations of path users
- Inconsistent application of Minuteman logo
- Lack of branded wayfinding to direction people to and from the Bikeway, Arlington Town Centers, and key network corridors

Existing Brand

The Bikeway has an established brand in the form of a logo, which illustrates a minuteman on a bike. As shown in the figures to the right, its use is inconsistent and does little to provide identity for the trail. In some instances, its use has been adopted for other uses. Place branding and landmarks should be clearly used and at an appropriate frequency to provide path users with the necessary information to figure out where they are relative to their destination.

Figure 26. Examples from the Minuteman



This overhead banner does not reflect the path's current alignment or assets.



Despite all of its improvements, the Lake Street intersection does not identify the Bikeway.



The use of the Minuteman logo has been co-opted by others, which detracts from the path.

Table 11. Wayfinding Examples

Identification and Orientation



<https://visitindiana.com/blog/index.php/2015/10/19/explore-the-cultural-trail/>

Directional



<http://cycle905.blogspot.com/2014/08/indianapolis-cultural-trail-good-bad.html>

Informational



https://www.valleybreeze.com/news/panels-celebrate-history-of-local-waterways/article_e431bcd1-7c13-58b3-a196-85eb9cd3bd6d.html

Regulatory



<https://nacto.org/2013/05/14/indianapolis-looks-to-peer-cities-as-it-aims-beyond-cultural-trail-success/>

A.



<https://www.cygnus.group/our-work/riverwalk-pathway/>



<https://www.greenvillesc.gov/316/Swamp-Rabbit-Trail>



<https://nextcity.org/urbanist-news/atlanta-beltline-growing-with-construction-of-new-section>



<https://www.cygnus.group/industries/cities-regions/>

B.



Bradford Rail Trail, Haverhill, MA



https://orleanshub.com/wp-content/uploads/2020/12/123020_Em-Trail.jpg



<https://www.wspa.com/news/majority-of-greenvilles-swamp-rabbit-trail-to-reopen-may-4/>



<https://www.cygnus.group/our-work/riverwalk-pathway/>

C.

The images in **Figure 27** illustrate the concept of signage families, which visually belong together. The use of too many signs or too many different signs creates visual clutter and detracts from the intent of a pathway for clarity, respite, and exercise.

This plan recommends a coordinated plan that has a hierarchy of signage for both the Minuteman and Arlington: different signs that accommodate different purposes, scales, and functions with a coordinated color, lettering, and underlying graphic design.

Within the graphic vision it is paramount to provide identity, direction, information, and regulations.

Figure 27. Examples of Signage Families



<https://i.pinimg.com/564x/80/56/a7/8056a7658fa2201551e0925821497040.jpg>

Strengthening the Brand

The Town has an opportunity to create its own form of landmarks by utilizing creative placemaking or signs. This starts with logical application of the existing logo.

The incorporation of major pieces of art, site features or monument signs can also work as long as they provide a certain level of consistency.

Figure 28. Branding Examples



Alternative examples of the logo using different figure/ground colors.



Examples of informational signs using the logo.



Examples of directional signs using the logo.

Trail Blazer

Sign with Parking Icon

Figure 29. Wayfinding Context Map



Wayfinding for Identity and Orientation

Often, finding a destination is not the problem but rather recognizing that you have found it. As such, the Bikeway needs a stronger sense of identity that makes access and egress to the path easily recognizable.

As shown in **Figures 30** through **33**, effective wayfinding employs the use of spatial organization, landmarks, materials, color, landscape, lighting, art, and signage to create recognizable trailheads and access points. Think of how the famous phrase ‘follow the yellow brick road’ provides both orientation and navigation. Instilling visual characteristics that incorporate a “spirit of place” will make the Bikeway more navigable as well as more memorable.

Landmarks

Landmarks are unmistakable visual elements that can serve as powerful orientation tools. Wayfinding should enlist or establish landmarks as a way to enhance decision-making and should be based on the most recognizable and memorable parts of the Bikeway’s surroundings. This might include the following:

- Waterbodies including the Arlington Reservoir, Spy Pond, and the Mill Brook
- Open spaces and parks
- Parallel routes including Massachusetts Avenue, Broadway, and Summer Street
- Cross streets including the old railroad bridges
- Neighborhoods or districts
- Prominent public buildings including the Arlington High School and Ed Burns Arena

Identification Signs and Route Monitoring

As the name implies, identification signs identify where the viewer is located and point out specific landmarks or structures. These signs do not provide direction; instead, they let users know when they have arrived at a destination. As such, it is important that they convey the name of the place.

The wayfinding typologies shown in **Figure 34** feature characteristics that identify the Bikeway as a consistent asset and orient users.

Figure 30. Path Gateway



<https://fallriverreporter.com/re-live-fall-river-history-in-free-queuechan-river-rail-trail-walk/>

Large granite sentinels with logos, cobblestone islands, and distinctive red site furnishings are clear visual cues to the location and identity of this pathway.

Figure 31. Hexagonal Paving



<https://foursquare.com/v/cultural-trail--downtown-indianapolis/4ba29cabf964a5202f0938e3>

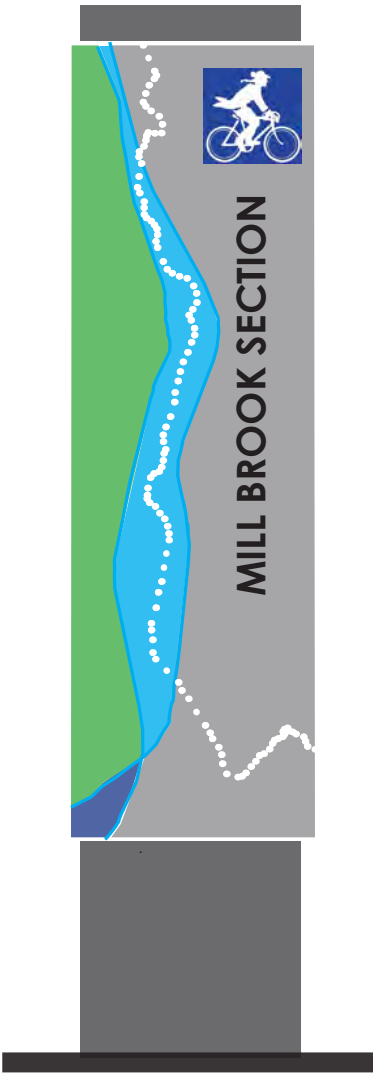
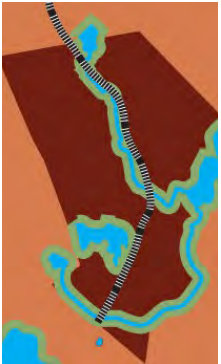
Distinct paving makes the Indianapolis Cultural Trail immediately recognizable.

Figure 32. Art Installation at Night



<https://indyculturaltrail.org/2015/04/20/tales-from-the-trail/>

The proliferation of art makes the Indianapolis Cultural Trail easy to find, even at night.



These abstract graphics are inspired by the interwoven form of Massachusetts Avenue, Mill Brook, and the Bikeway and provide a compelling example of site specific design responses.

Figure 33. Context Driven Graphics

Figure 34. Conceptual Identification and Orientation Signage



Wayfinding for Direction

Create Well Structured Paths

Both access and egress to the Bikeway need to be clear and structured. Employ hierarchies in spatial configuration, materials, and signage to denote public access and egress points and to identify priority routes. Guide path users between various points (origin/destination) using clearly defined characteristics that improve the ease and efficiency of the wayfinding system.

Directional Design

Directional design helps users decide how they are going to get from one point to another following maps, directional signs or other visual cues. Route selection should answer the following questions:

- Can I get to where I want to go from here?
- What is this the shortest and most convenient route?
- Are there other things that this route offers me in terms of pleasure and comfort, such as nearby restrooms, food, or water?

Directional Signs

Directional signs are what most people imagine when they think of wayfinding. These signs keep people moving toward their final destination. Directional signs typically appear at junctions or anywhere someone might look for directions. These can be combined with Identification signs as needed. Typical directional signs include the following:

- Route Markers – these signs reinforce the route that path users are on and should be relatable to maps or other navigational means.
- Trail Blazers – these signs point users to and from the Bikeway. These signs should be placed along priority routes that provide safe and efficient access to the Bikeway.
- Maps – detailed maps are an essential component for wayfinding, as they offer users both location and direction.

Even in the days of smart phones, people want to know where they are and where they are going. Physical maps aid in that information process. Maps should be varied to show the relative scales of the overall path as well as smaller areas of Arlington that are of value and interest. Wayfinding signage should also be scaled and proportioned to fit the maps.

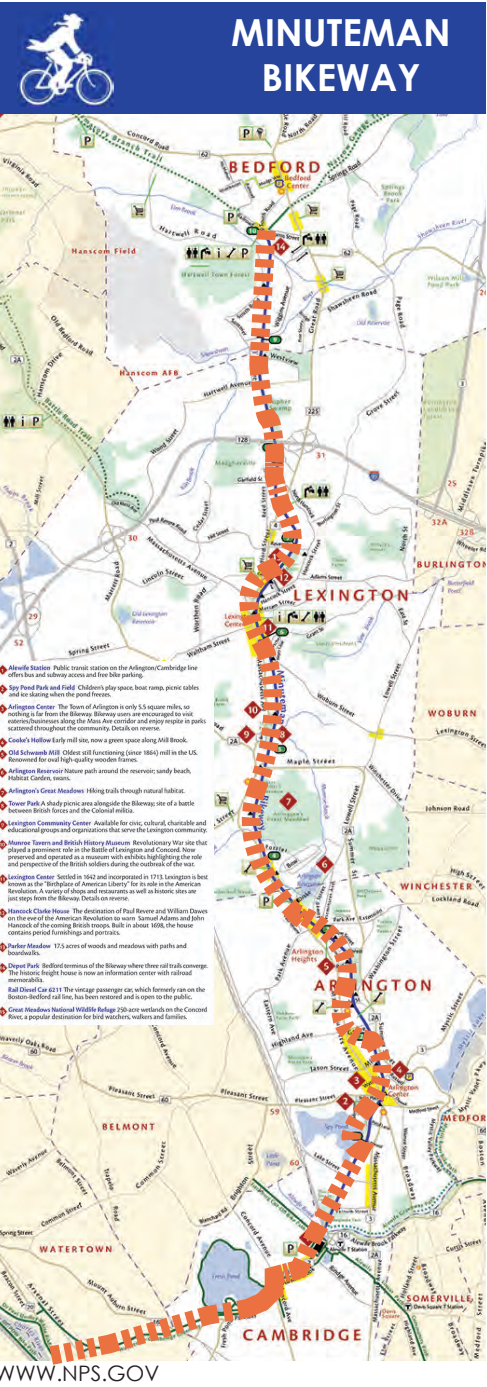
The wayfinding typologies shown in **Figure 36** feature characteristics that provide directional information along the Bikeway and to and from the Bikeway.

Figure 35. Regional and Local Map Scales

Wayfinding signage should reinforce that there is a whole trail context as well as provide specific Arlington-related information and wayfinding experiences.

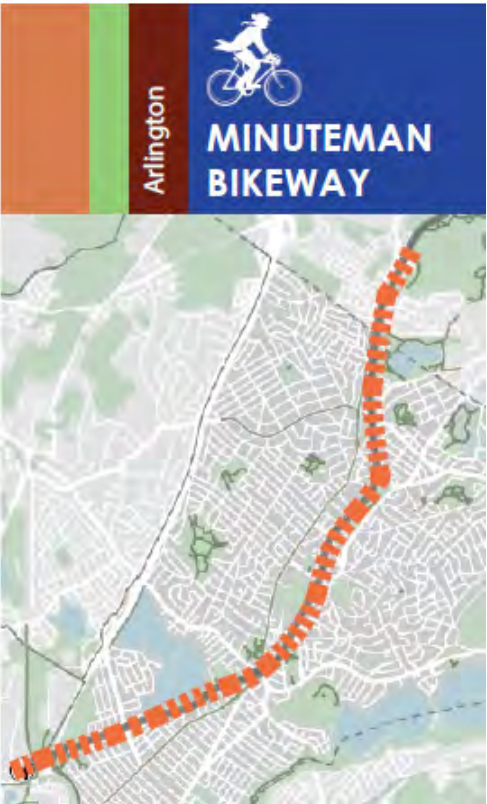
The Minuteman Path as a whole:

While there is an existing downloadable map available online, the role of the path as a multi-town connector should be a prominent physical feature along the Bikeway as well.



The Arlington Section:

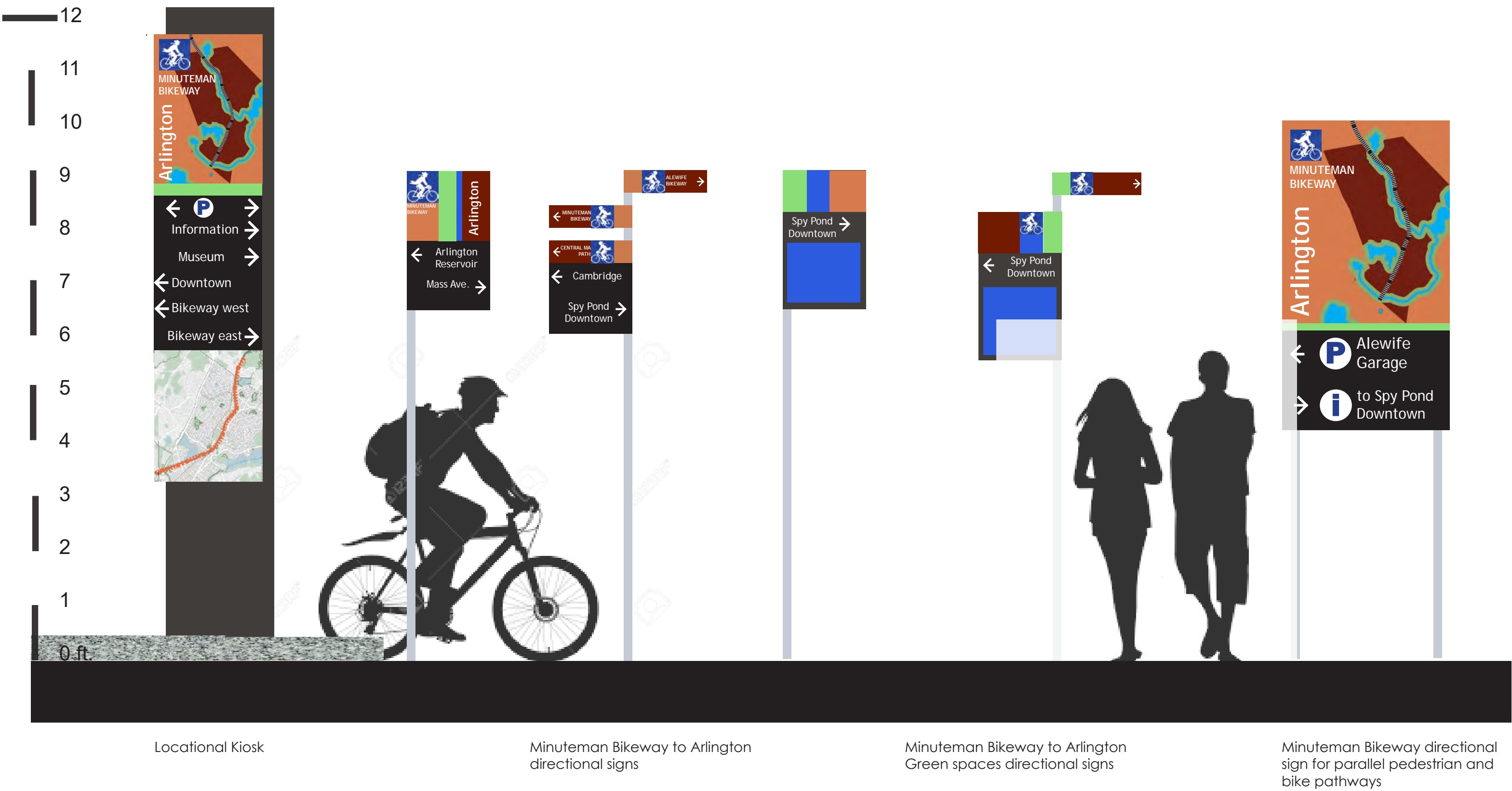
Arlington has a rich variety of areas with amenities and connections to and from the Bikeway. Wayfinding structures selectively placed along the Arlington section can bring relevance and awareness to path users.



Areas of Arlington:

Geographic areas break down Arlington for interesting pass-through views and experiences and well as local neighborhood history and identity.

Figure 36. Conceptual Directional Signage



Wayfinding for Information

Informational signs are less about moving toward a destination than supplementing the trip with useful information along the way. For Bikeway users, these could include information on Bikeway policies and etiquette, historic or natural features, places to eat, or locations of restrooms.

Approach

The Bikeway offers a number of historical and contemporary layers. As such, wayfinding requires the integration of a number of design and planning disciplines: urban planning, landscape architecture, transportation engineering, graphic design, creative placemaking, ecology and history. This is valuable because the sum total of this multidisciplinary approach will appeal to everyone - whether bicycling the pathway as a commuter, taking a Sunday afternoon stroll with family, or exercising. Consider some of these possibilities:

- The Bikeway design unto itself could be a visual experience reinforcing its role as a connection of Arlington neighborhoods as well as a larger multi-town pathway with integrated community centers.
- Signage along the Bikeway could reinforce decisions people make about where they are traveling, their safety and comfort, and manners and regulations for people that use the path.
- Both digital and physical maps could help people see where they are in relation to the surroundings of the Arlington community as well as the larger pathway network.

Avoid Clutter

A key consideration should be to avoid too much information or too many navigational choices. The goal of wayfinding is about developing cohesion to aid decision-making. This is achieved by only offering up the most relevant information regardless of whether there are multiple ways to get between points or not. This prevents confusion and creates a clean, efficient navigational process.

The wayfinding typologies shown in **Figure 38** feature characteristics that inform path users of the many environmental, cultural, and historical features found along the Minuteman bikeway.

Maintenance and Costs

Signage should take maintenance and sustainable practices into account to ensure longevity. Typically, directional and informational signs panels are constructed in a similar manner to regulatory signs to minimize special components.

For custom signs, information panels should be constructed to be replaceable if necessitated by damage or by required updates to the messaging.

Typical unit costs for each sign type are displayed in **Table 12**.

Figure 37. Replaceable Signage

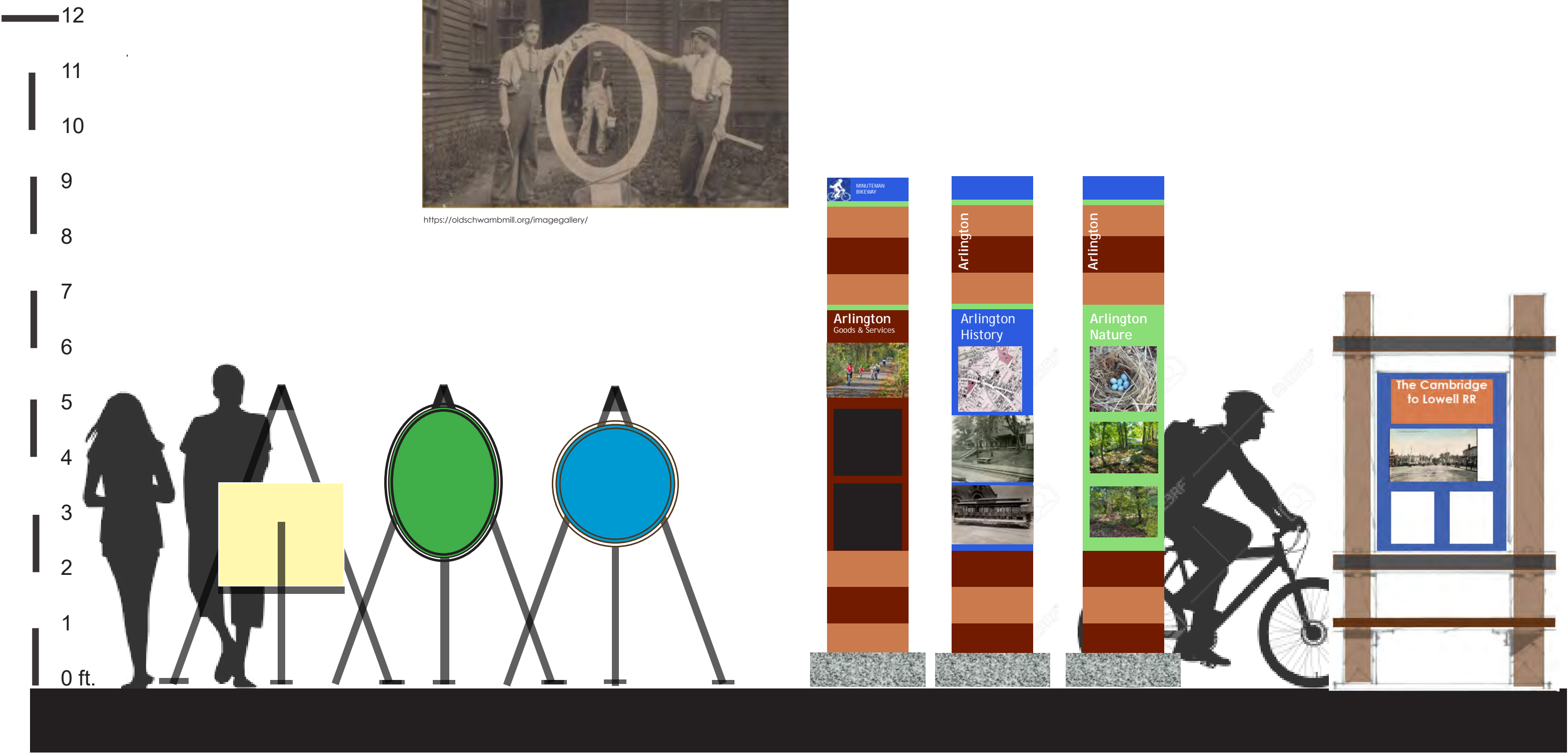


An example of a standard aluminum sign panel mounted to a custom sign board. The panel can be replaced or updated as needed.

Table 12. Unit Cost of Wayfinding Signage

Wayfinding Signage	Unit	Unit Cost
Identification & Orientation Pylons		
> Primary	EA	\$10,000
> Secondary	EA	\$2,500
Directional Signs	SF	\$20
Posts	EA	\$220
Informational Signs	SF	\$20
Posts	EA	\$220
Regulatory Signs	SF	\$20
Posts	EA	\$220

Figure 38. Conceptual Informational Signage

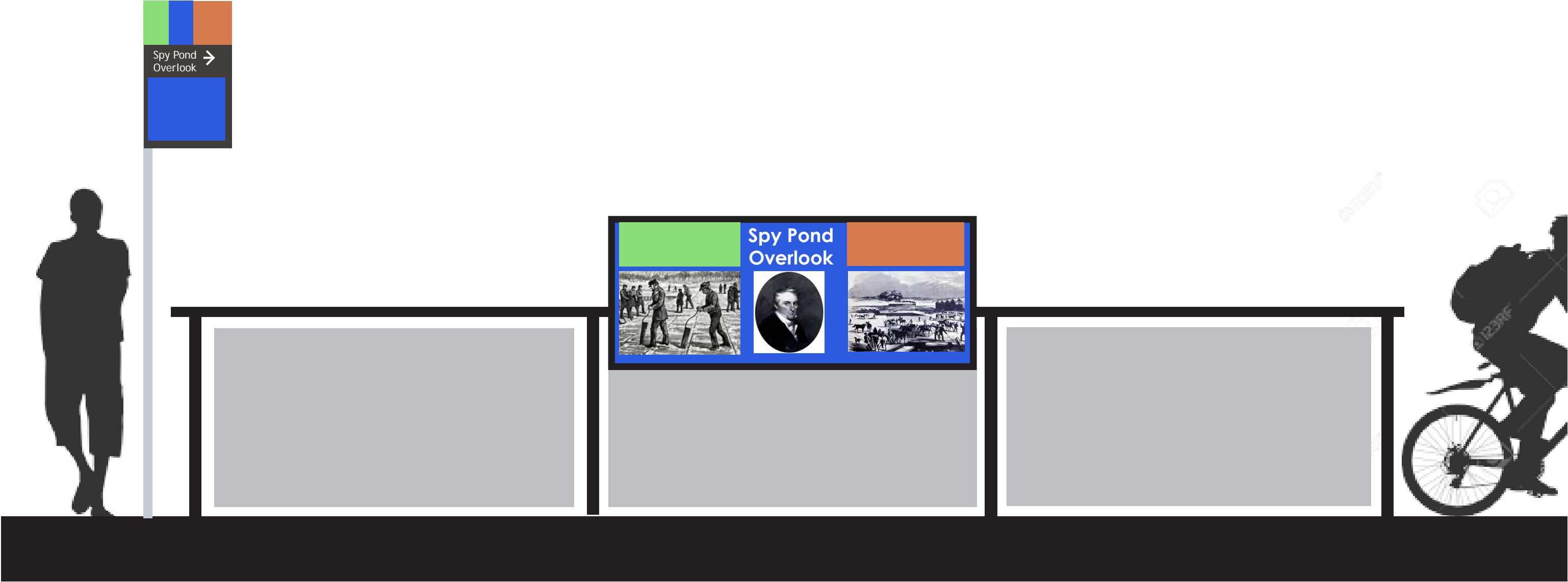


Picture frame easels for public art fashioned after round and oval frames manufactured at the Schwamb Mill

Kiosks detailing natural, historical and cultural elements unique to Arlington

Interpretation signage highlighting the Cambridge to Lowell Railroad with rail and tie theme

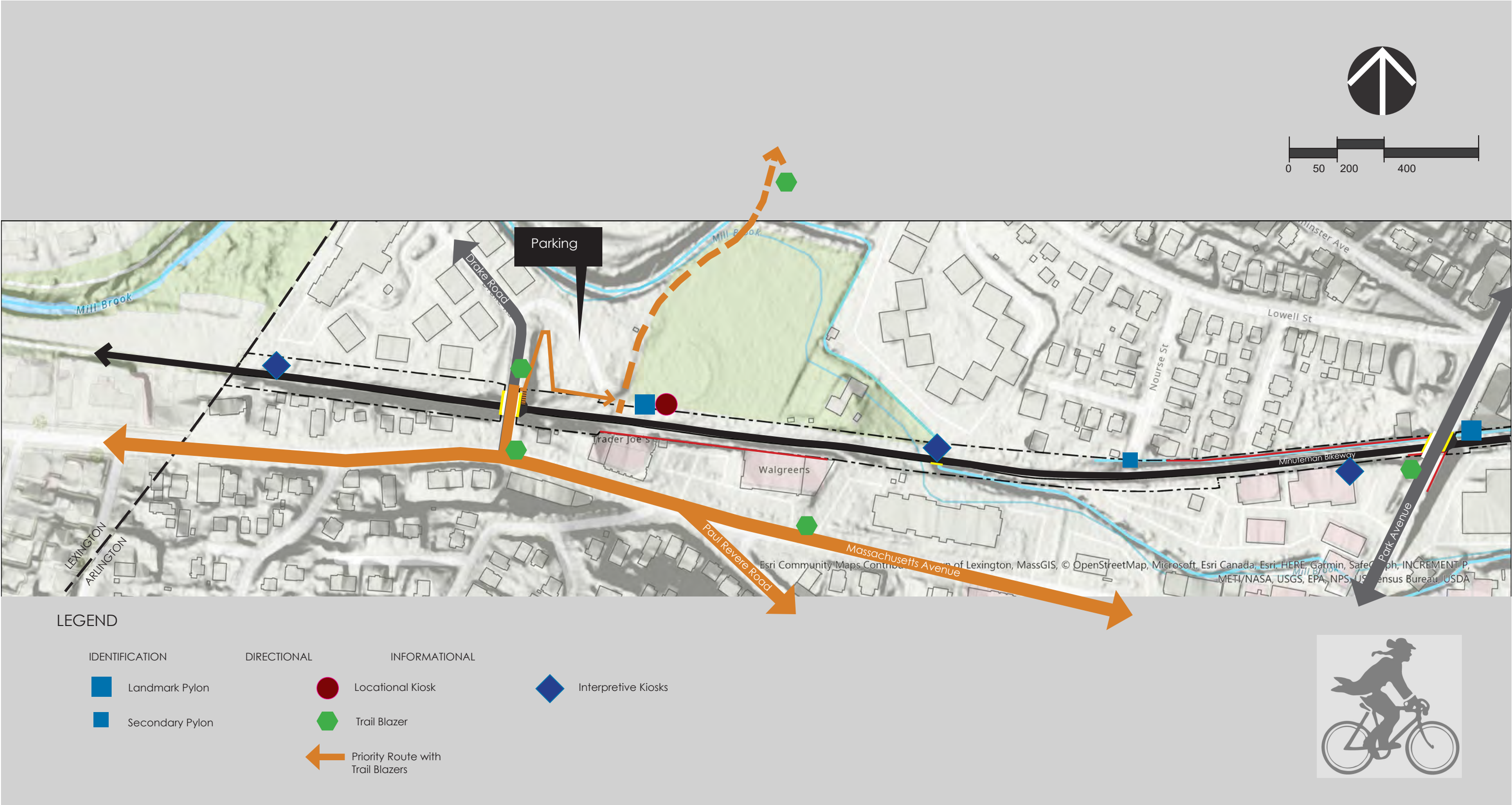
Figure 39. Conceptual Informational Signage at Overlook



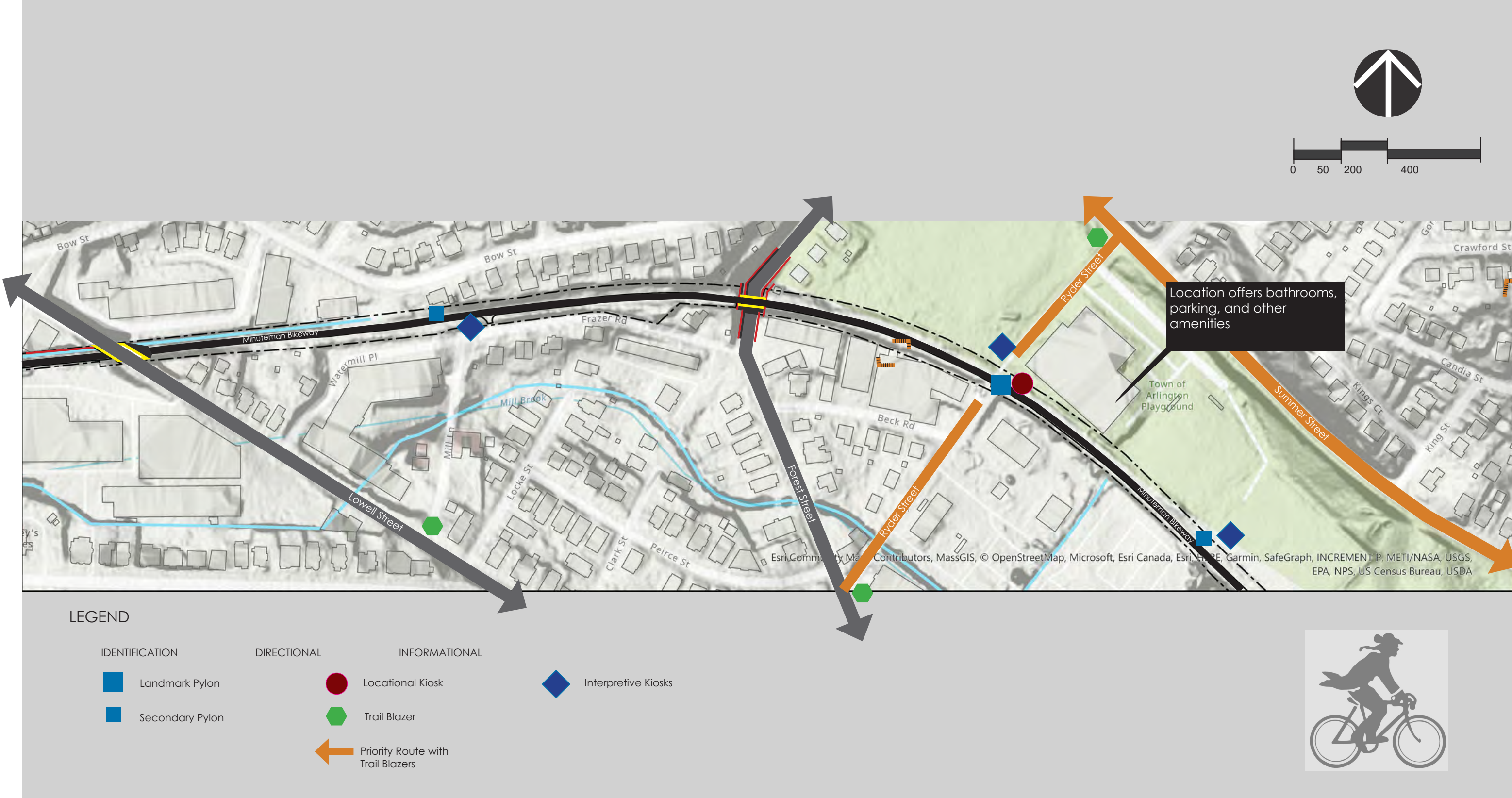
Natural and historical scenic overlook with interpretation

Figure 40. Proposed Wayfinding Plan

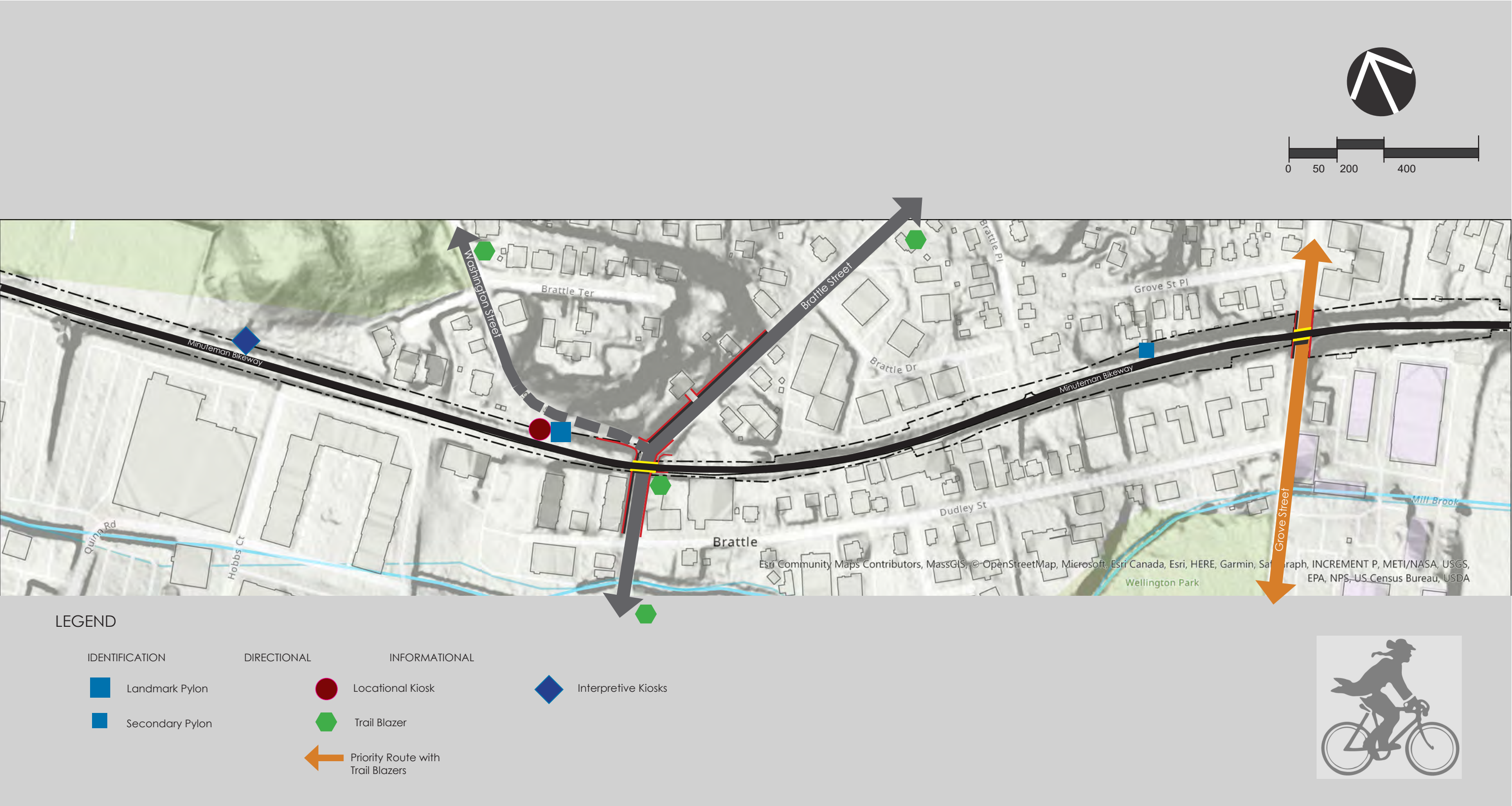
Lexington Border to Park Avenue



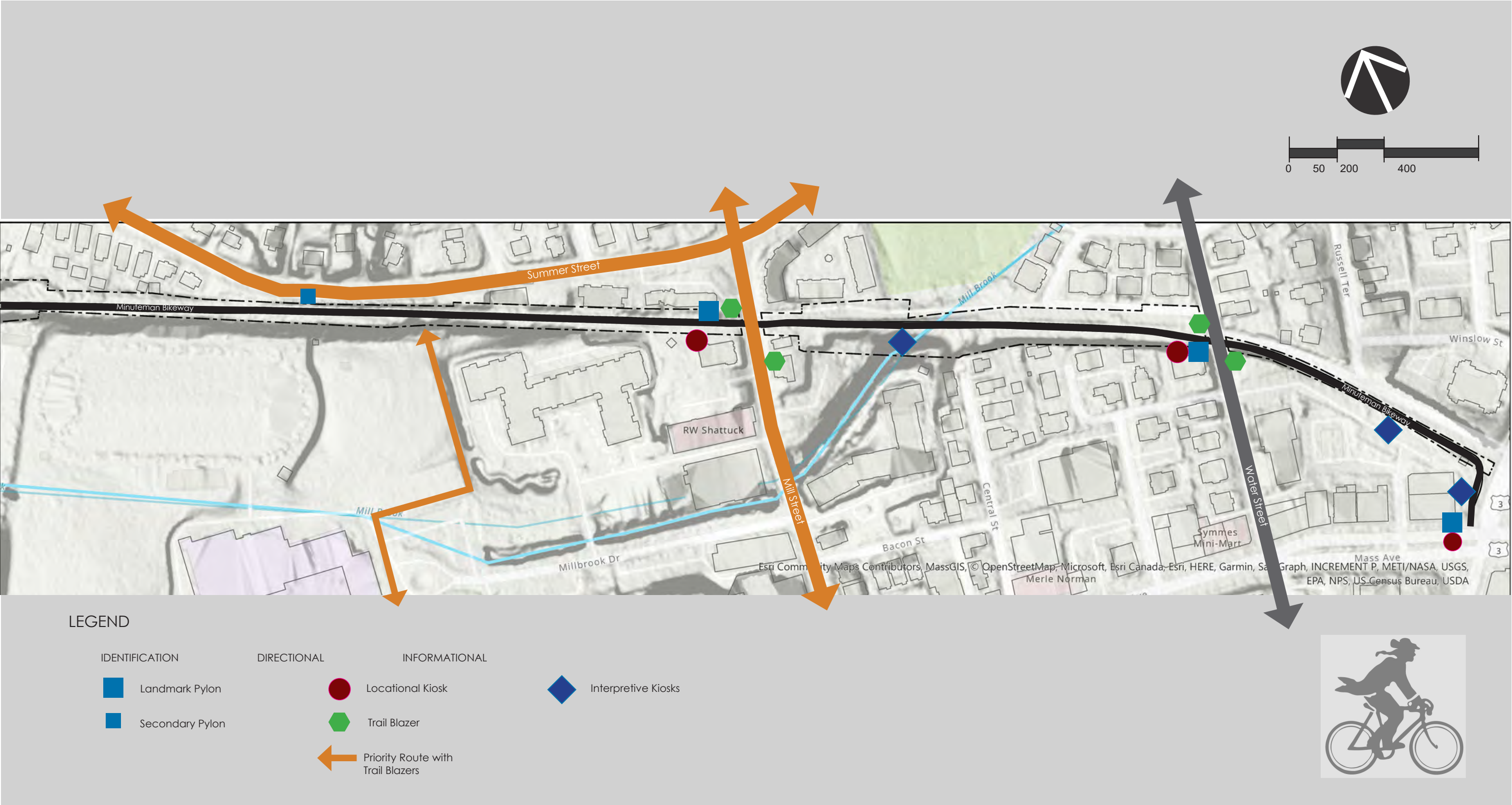
Lowell Street to Hill's Hill



Hill's Hill to Grove Street



High School to Mystic Avenue



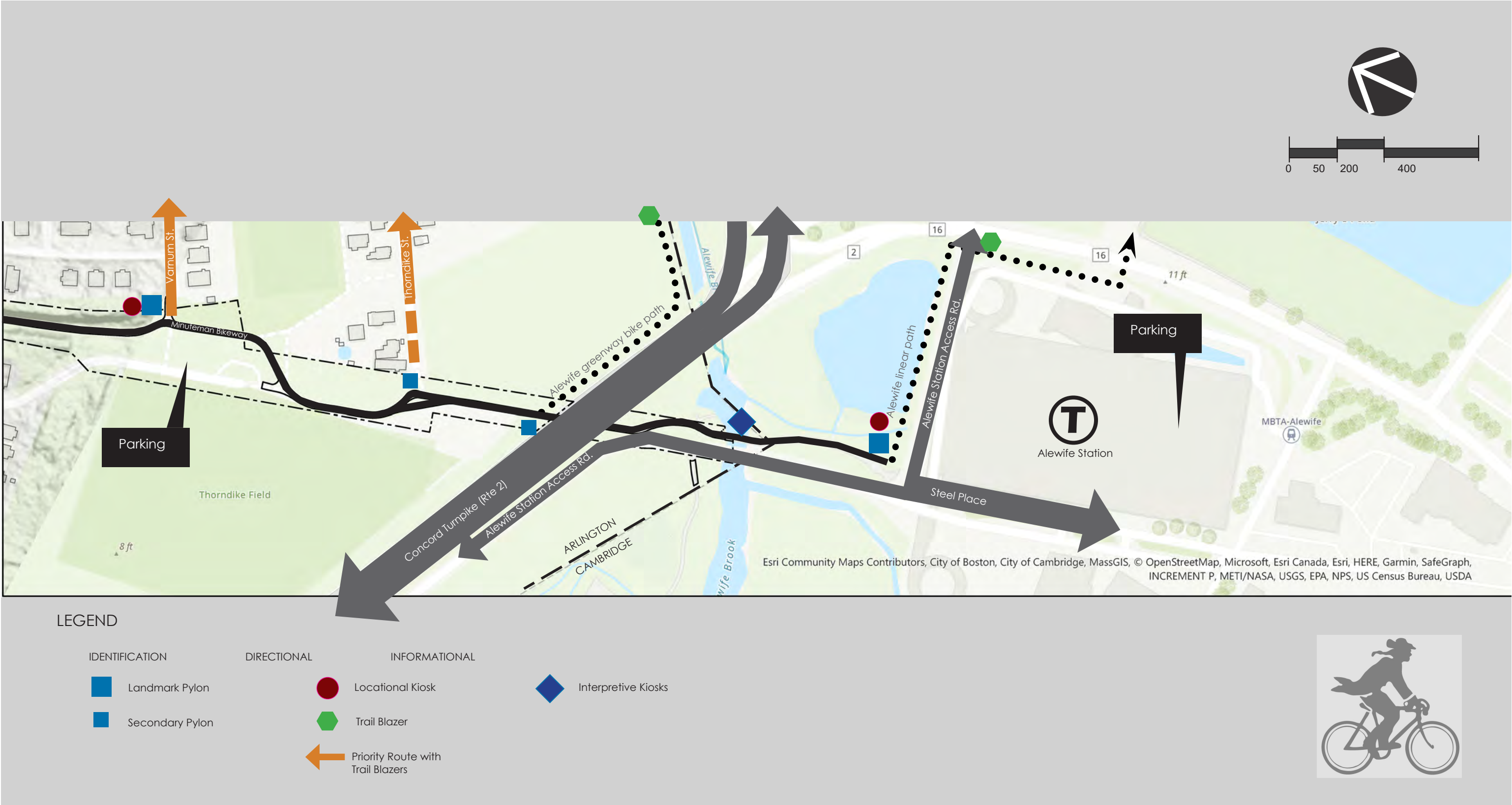
Mystic Avenue to Scannell Field



Scannell Field to Thorndike Field



Thorndike Field to Cambridge Border



CREATIVE PLACEMAKING AND PUBLIC ARTS

Based on community feedback, the priorities for placemaking include the following within the component categories outlined in Chapter 1:

- Access and orient: Informational signs or kiosks with maps rules and policies
- Rest, and regroup: Views and vistas
- Immerse: Natural areas
- Recreate: Secondary paths

What is Creative Placemaking?

Creative placemaking integrates arts, culture, and design activities into efforts that strengthen communities. This centers around the shaping of public space that seeks to enhance the quality of life, economic prosperity, recreation, arts, tourism, and other activities. Placemaking can be applied to an entire town, but more typically it is focused on a district or location within the community that demands a particular focus of imagination that is similar to the creativity process of an artist or designer. This approach aims to increase vibrancy, improve economic conditions, and build capacity among residents to take ownership of their communities.

Placemaking for the Minuteman Bikeway

Placemaking for the Minuteman Bikeway requires tapping into natural, cultural, and historical elements including the following:

- Pre-colonial development
- Local revolutionary war events
- Development along the Mil Brook Valley
- Coming of the Railroad
- Birth of the Minuteman Bikeway
- Current life and peoples
- Meaningful art

Following the methodology’s taught by the National Center for Creative Placemaking, there are key components necessary to engage the public and also envision creative designs for the Minuteman Bikeway. These include the following:

- Make sure that the larger artistic community of Arlington is engaged, reaching out to groups to encourage their involvement and the benefits of artistic inspired material for the public spaces of the park.

- Broaden the themes and application of public arts to incorporate history and the environment in specific stories of the Bikeway and its origins in the town.
- Make sure to reach out to the community for the homegrown creativity of the residents and their knowledge of the place, the people, and the story of the Mill Brook watershed and the context of this part of the town, as the path cuts across Arlington.
- Reach out to the Arlington Conservation, Recreation and Historic communities.
- Consider creative design themes for the Bikeway that could help to organize people’s thoughts into strong concepts with powerful creative force - to extract a really strong storyline to make the public spaces and designs inspired by the past and the future.

Figure 41. Section of Schwamb Mill

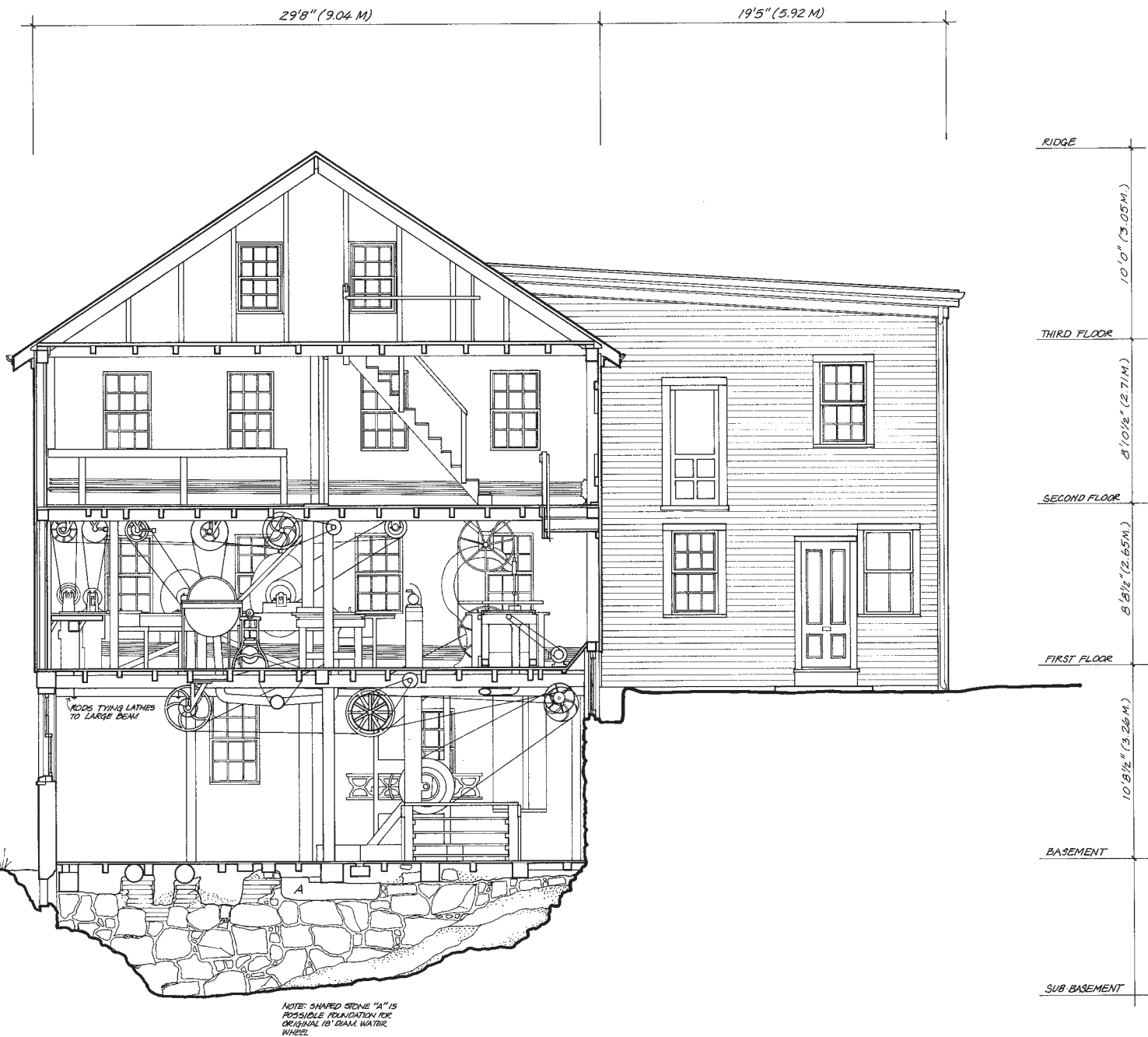


Figure 42. Inspirational Themes for Creative Placemaking

The History:

Real history took place here within the Mill Brook Corridor dating back to the formative moments of our country's independence.



<https://lh3.googleusercontent.com/Jm0IupcU2w-Fwm0xSmml-uQ7o0dx7LOFN5giFnL9m-47KRJ5qm0HTAf2L1AeCa1QXX11=s114>



Clipper City Rail Trail



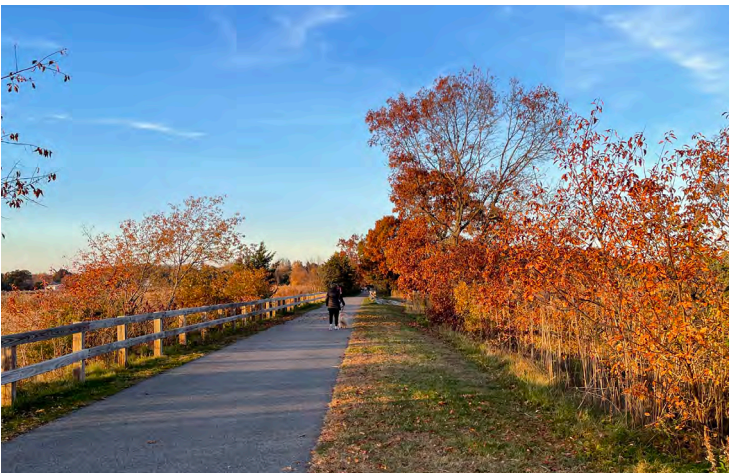
<https://thumbs.dreamstime.com/z/old-rusty-vintage-railroad-tracks-closeup-rail-transportation-concept-153543582.jpg>

The History:

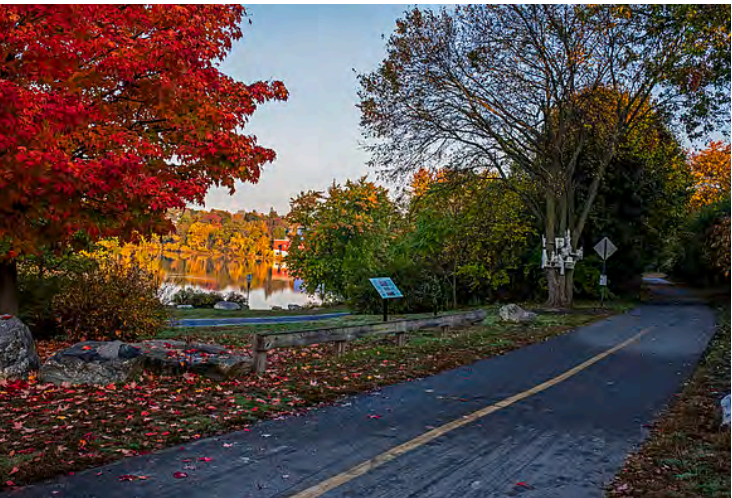
The Railroad developed along the banks of the Mill Brook to support the mills.



Clipper City Rail Trail



Salisbury Rail Trail



<https://images.fineartamerica.com/images/artworkimages/medium/3/autumn-morning-on-spy-pond-in-arlington-massachusetts-fall-foliage-minuteman-bike-trail-toby-mcguire.jpg>

The Environment:

Waterbodies formed the town and its routes of travel and commerce.



<https://swacdn.s3.amazonaws.com/wp-content/uploads/2019/02/16210513/Hunters-Point-South-Phase-II-David-Lloyd-0505.jpg>



https://lh3.googleusercontent.com/g2Yua45ZjDsndEznTKHrDAP--qk5iS9ISAlunzp34shs0R66S2n-MyKKOqihSg56_Kfy=s151



https://lh3.googleusercontent.com/UIGIC-WEJqhXUY7d-6OStOCsc3cSZ9YEaXQu4n-kwQri_uKk-BuM6KtQAvT3trfpB40DPA=s128

The People:

Noted artists, scientists, musicians, and politicians all made up a history of human invention and creativity.



https://schwambsite.files.wordpress.com/2019/04/theodore-schwamb-article_1.jpg

<http://dallin.org/wp-content/uploads/2021/03/Dallin-with-Mystery-Man-Getty-300x256.jpg>



<http://dallin.org/wp-content/uploads/2021/03/Hunter-cropped.jpg>



https://www.thevintagenews.com/wp-content/uploads/2017/05/1024px-Ice_Harvesting_Massachusetts_early_1850s.jpg

The Environment:
Wooded areas to rest and regroup.



https://myphillypark.org/app/uploads/2020/04/IMG_20190905_114728-e1585922518198-600x400.jpg



<https://freedommobilitycenter.biz/wp-content/uploads/2019/12/Enjoying-the-Great-Outdoors-Seven-Tips-for-Wheelchair-Hiking.jpg>



https://www.nps.gov/common/uploads/cropped_image/primary/A6A1B9F8-B0E5-15DF-00EB-CF0F2339D571.jpg?width=1200&quality=90&mode=crop

The Art:
Artists providing creativity and interpretation of the world we live in.



https://img.atlascobscuro.com/SUHxxbGq65R1F46kw-GOBIf_J_-MQ9dc6Sinu9kG9sU/rt:fit/h:390/q:81/sm:1/scp:1/ar:1/aHR0cHM6Ly9hdGxh/cy1kZXYuc2MuYW1h/em9uYXdzLmNvbS91/cGxvYWRzL3BsYWNI/X2ltYWdlcy8yMWFm/ZmY5MDM4Y2Y2NiMWRh/MGQxODc4ZjBhNWE4/MzVl-NGZhYjJkMjkz/LnBuZw.png



GPI



https://lh3.googleusercontent.com/eEf3Ke4IuQFNzXCdyamz9_7rSUBseevxyuhLy5sAnfBRKA-94kqOxej9giZ7Lzhnsok8E-s85

Blurring the Lines:
See common things in new ways.



<https://i.pinimg.com/736x/17/a3/2b/17a32b473f8da2fe2454a748cbab3b8a--arches-environmental-art.jpg>

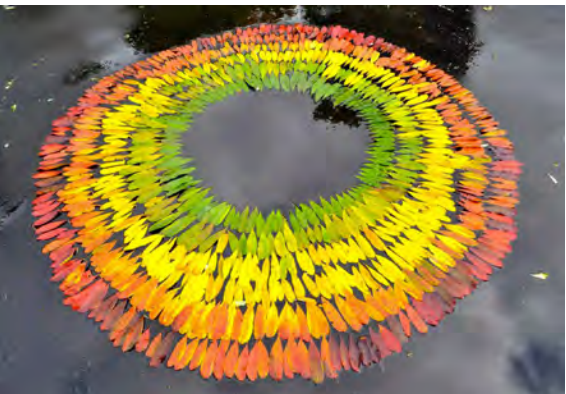


https://lh3.googleusercontent.com/uM6b9shp2_XC8kS_GO9PdP0iseMEhokCxcz4TbULB5lrrn-6R67cD0UST8lx9lWkRt=s113



<https://www.heraldscotland.com/resources/images/4345259/>

Providing the Unexpected:
See common things in new ways.



<https://i.pinimg.com/originals/ff/34/3d/ff343d65cf10bb504f129b063172ce63.jpg>



<https://i.pinimg.com/236x/9d/9b/0a/9d-9b0a2232ed554bec3d44f15603b408.jpg>



<https://inhabitat.com/wp-content/blogs.dir/1/files/2018/02/JamesBruntArtc1-889x732.jpg>



<https://i.pinimg.com/originals/6c/19/0a/6c190a-2793d175a302d975c4457c4af7.jpg>

Supporting Infrastructure:
Providing pathways that feel like they belong.



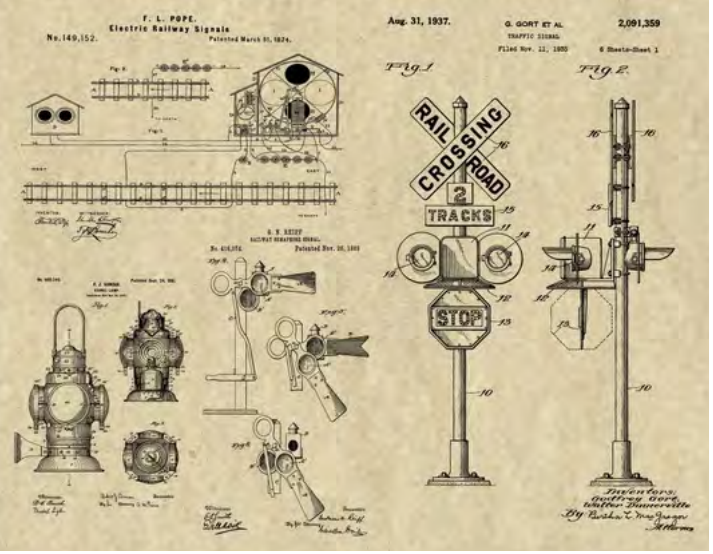
https://lh3.googleusercontent.com/KmMepMGU_NkmhPrqNqxyOGzC5zCwLsY3QUCERPy-TQeIVXNtv40XxJigmv7bxwNuRgzK3Q=s113

Site Furnishings:
Artistic execution of functional elements.



https://lh3.googleusercontent.com/0S4zeq_J8YrxVEOpXnFOmdzq_N7TEUuDu5sw2plqwQvR-pogTgv-StXdh_oUrD9UydJKg=s85

Bygone Technology:
Interpretation of formerly common elements.



https://i.etsystatic.com/15993692/r/il/4780df/1661751381/il_570xN.1661751381_mr3n.jpg

Details:
Keep the world interesting.



https://www.schuylkillcenter.org/news/wp-content/uploads/2015/08/20_239-artists-have-participated-in-shows-here-since-our-environmental-art-program-started-in-2000.jpg



<https://lh3.googleusercontent.com/vTdw78nalcv8j2rUzgH9hn9PK8x28TDtWf3PhuEvEqOXFw-bl2TUQc-t-OP3ppYL-7sXY=s108>



<https://thumbs.dreamstime.com/z/grassy-amphitheatre-trees-e-grassy-amphitheatre-106235479.jpg>



https://encrypted-tbn0.gstatic.com/shopping?q=tbn:ANd9GcTq8hacXkci4Qbex-SwwohwCdqfB4psJfx4qhVHaaYHEvAF_DEqdUREAAf65ZJo1cy1XK5anMIKDDN--xxCsWXaefB_ZqeJsgLatAdrv1DA&usqp=CAC



<https://i.pinimg.com/222x/51/92/60/51926055a12607939611b532fb6e25dd.jpg>



<https://lh3.googleusercontent.com/kwZ3ufkTxfwW7pfsaeePoR5qrKDJTfJ5vAjexQs6Fr0s6ZSYh-VGBB7NVhaAD3ZnqdoVfM=s103>



https://lh3.googleusercontent.com/0T0XNFF69Y30jJQ4tsLowtNM0vDaXUO7cxJsJkVnQAFF-4fr5_ailNv5dr3Cx8PRk79l=s85



<https://lh3.googleusercontent.com/IXHC4vqPOEpPDC9rFcs0Zytwp7-d6P-Y9Tiw5wEi5fQED-1W5BfCJjrZOMfimsZuOLKNeug=s113>



<https://lh3.googleusercontent.com/1IAIEDZxQ-LO-v6VGKyHyO6wr-tx1nAmktAESCszUbsNYohc-1V9D6gEdFg9Nm4M8O2oRmA=s122>

DEMAND MANAGEMENT

Crowding on the Bikeway poses a major challenge to the functioning, safety, and comfort of the facility. As a regional, off-street route, the Bikeway is relied on by a large cross section of the community to fulfill a wide range of purposes, some of which are in conflict with one another. The array of user types, modes, ages and abilities has led to conflicts and has even caused some people to avoid the Bikeway altogether on weekends or during the busier seasons. Speed disparities between cyclists and other users can cause friction and create conflicts while children and pets can be unpredictable.

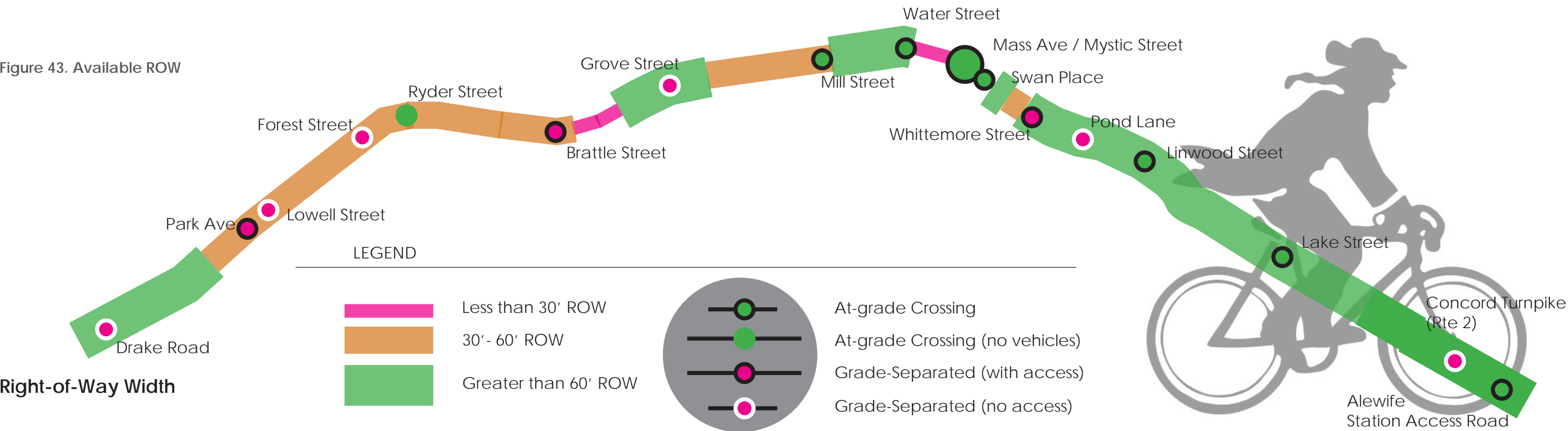
The following approaches to managing this demand have been explored:

- Widening the path to create more space for users along the corridor as well as at crossings (similar to Lake Street reconstruction)
- Separating users in space through the establishment of user envelopes
- Installing traffic calming treatments to encourage slower traveling speeds and increased caution
- Improving safety and comfort at access points to the Bikeway
- Improving safety and comfort on alternate routes to distribute multimodal activity across a broader array of facilities

Widening the Bikeway

This section examines key factors that influence the potential for widening the Bikeway. These factors include available right-of-way (ROW) and topography, as well as alternative approaches for path widening. The potential for widening is largely dependent upon available ROW and the existing topography. Other limits on feasibility (outside the scope of this study) are existing vegetation, sensitive receptors (i.e. abutters), and environmental resource areas.

Figure 43. Available ROW



Available Right-of-Way (ROW)

Figure 43 shows a high level review of available ROW along the corridor. Typically, old railroad corridors, such as the one on which the Bikeway was constructed, were based on a 66' unit, with ROW varying further based on the number of tracks, passing sidings, freight sidings, or passenger stations. Since Arlington was founded before the construction of the railroad, the width of the corridor varies based on built conditions at the time of construction.

As shown in Figure 44, the segment of ROW between Water Street and Mystic Street is the narrowest section along the Bikeway.



Figure 44. Narrowest segment of ROW between Mystic Avenue and Water Street

Maintenance Widening

Maintenance widening refers to the practice of cutting back vegetation that has reduced the functional width of the Bikeway. It does not physically widen the path but is more about recovering what already exists. As discussed in Chapter 1, there are numerous areas where vegetation has closed in on the trail obscuring sight lines and reducing the usable width. A few limited areas were observed to be buried under layers of leaf litter and sediment which has narrowed the usable width of the path.



Figure 45. Widening via maintenance

Simple Pavement Widening

In its simplest form, pavement widening consists of adding path width to one or both sides of the existing Bikeway. Relevant examples are shown in **Table 13** and can take a variety of forms that include the following:

- **Symmetrical Widening** - Symmetrical widening involves adding equal widths to either side of the trail. This can be of a like material but given the user volume and conflicts that have been documented along the Bikeway, it is advisable to reinforce different user zones through the use of pavement striping and/or an alternate pavement (1A). Typically this is done using asphalt for bikes and concrete or concrete pavers for pedestrians (1B). Other materials that have been used on trail shoulders include the use of poured-in-place rubber (1C), which comes in different colors and is comfortable for runners.
- **Asymmetrical Widening** - Asymmetrical widening involves adding width to the path on one side of the Bikeway only. This can be employed to separate out pedestrians from conflict. Similar to above, this can be expressed with striping (2A, 2B) or alternate materials (2C).

While simple widening increases the path width, it alone does not provide separation of user types and may increase volume and the potential for conflicts. Simple pavement widening is best employed where constraints or obstacles make other types of widening impracticable.

As noted, alternate paving materials can be used to differentiate use zones and might include the use of colored asphalt, concrete, poured in place rubber, or soft surface paths (stabilized aggregate). However, loose aggregate should be used carefully around paved riding surfaces as it is easily tracked or eroded and can create added safety issues.

Table 13. Simple Pavement Widening

1. Symmetrical



Netherlands
Image Source: <https://bicycledutch.wordpress.com/2020/08/12/cycle-lanes-in-the-netherlands/>

2. Asymmetrical



Sweden
Image Source: <https://visitsweden.com/what-to-do/nature-outdoors/biking/enjoy-day-your-bike-sweden/>



Nigeria
Image Source: <https://omonaij.wordpress.com/2012/11/04/nigeria-introduces-bike-lanes-bans-okada/>



Guimarães, Portugal
Image Source: https://encrypted-tbn0.gstatic.com/images?q=tbn:ANd9GcQ61KG1Om_hcRbM8zn1pXZKx9SFX-9X7RZV5eoKbQA0Jw-Z0ltpcWL2bksetwyZOS1HwMk&usqp=CAU



Somerville Community Path
Image Source: https://en.wikipedia.org/wiki/Somerville_Community_Path



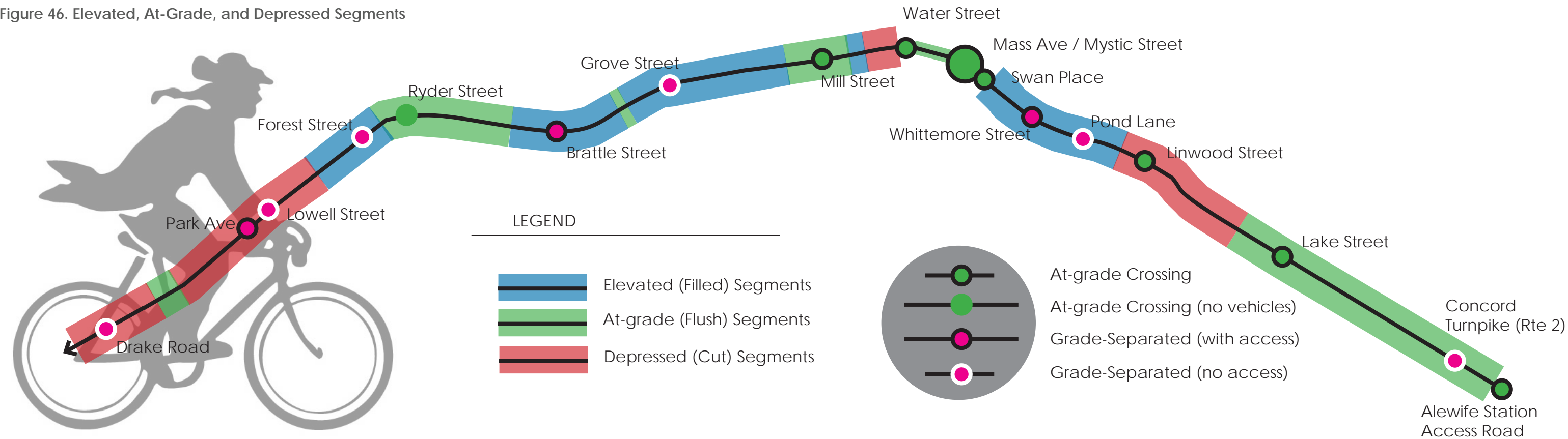
Boulder Colorado
Image Source: <https://boulder.colorado.gov/services/bike>

A.

B.

C.

Figure 46. Elevated, At-Grade, and Depressed Segments

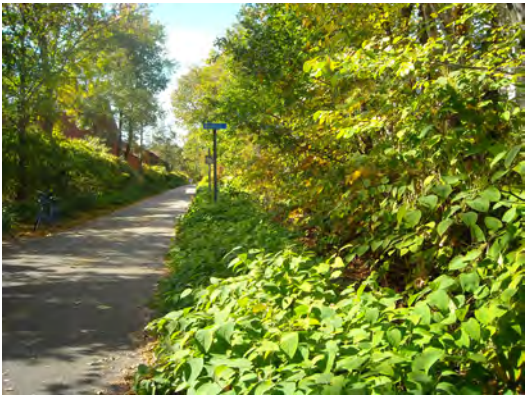


Existing Topography

Railroad corridors were typically designed to a fairly flat slope (1%-2% maximum) to enable trains to pull massive freight loads. A review of the original Bikeway profiles indicate that the path closely followed the old rail corridor and on average had a slope between 0.0% to 2.0%. Almost imperceptibly, the Bikeway climbs 150 feet vertically, heading west from elevation 10.0 to elevation 165.0.

To achieve the desired railbed required finding the optimum balance between cutting high ground and filling low ground. **Figure 46** provides a general overview of the three ground plane conditions along the trail. These include the following:

- Depressed (Vee Cut) Segments** - these areas made use of low lying areas or were intentionally cut down to facilitate construction or grade separation. This condition is common to areas where the Bikeway was lowered to pass under roads, or in some cases where the surrounding ground has been built up.
- Elevated (Filled) Segments** - the trail has a number of elevated areas that either rode the high ground or were filled with borrow (earth, sand, etc.) to achieve the desired grade. This condition is often found where the Bikeway passes over streets.
- At-grade (Level) Segments** - these areas are located at or near the original ground plane and are common to at-grade street crossings.



Depressed (Vee Cut) Location

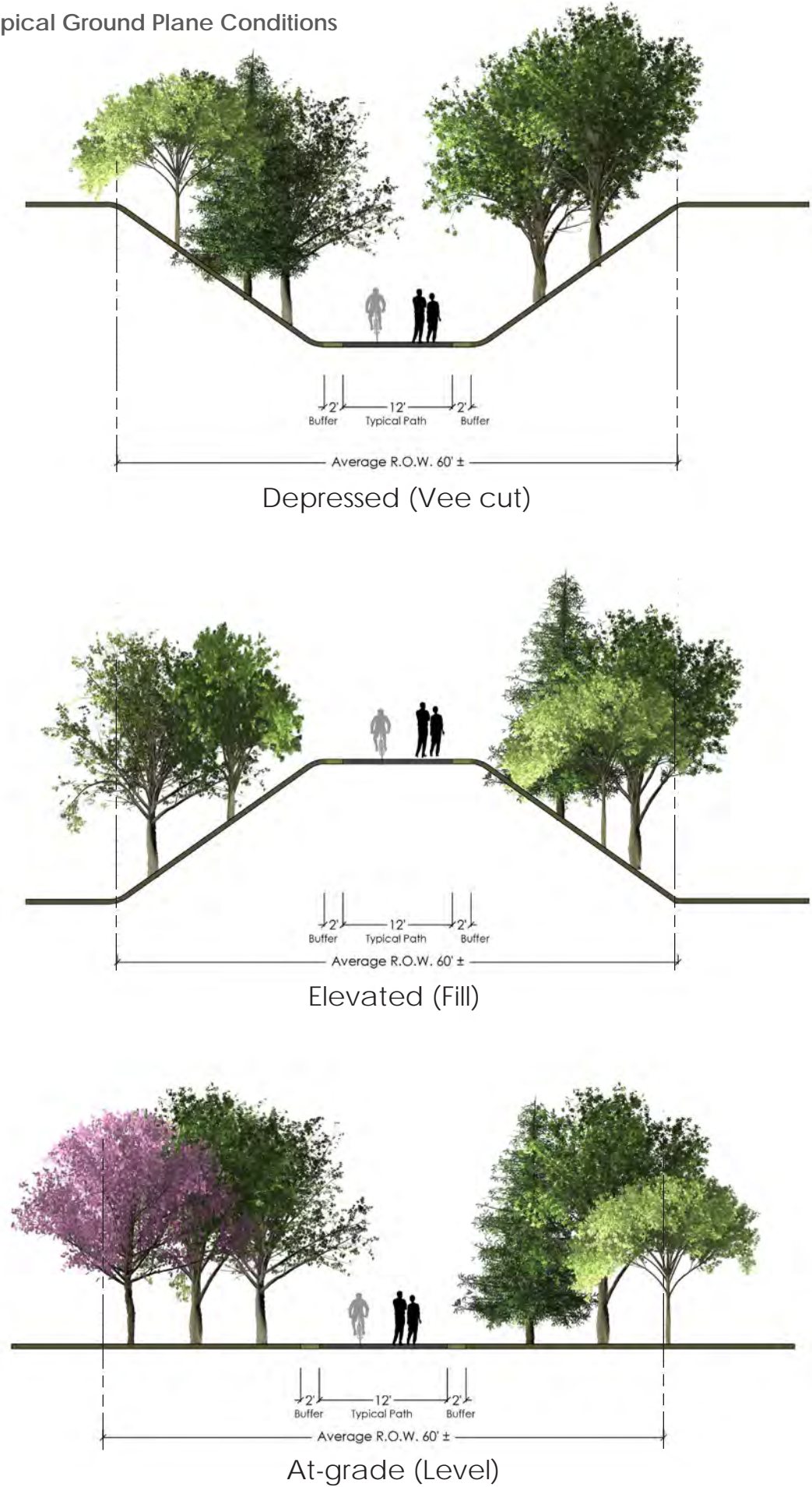


At-Grade (Level) Location



Elevated (Filled) Location

Figure 47. Typical Ground Plane Conditions



Potential for Widening

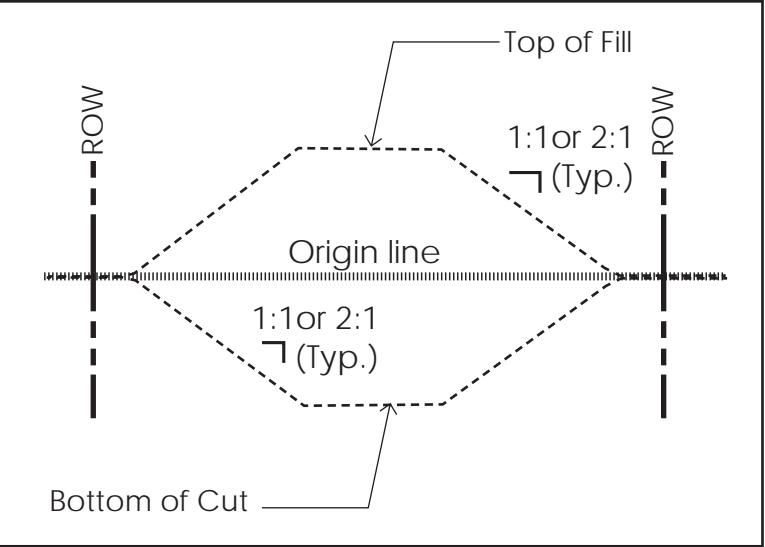
Assuming a consistent ROW, the at-grade portions of the Bikeway exhibit the most room for widening, as there is no loss of space due to side slopes. This is demonstrated in **Figure 48** where both the top of fill and the bottom of the cut are typically reduced in width to about 1/3 of the overall ROW width.

Ground Plane Manipulation

In certain locations, widening of the trail bed can be achieved through manipulation of the ground plane as shown in **Figure 49**. Essentially, this is reversing the cut or fill process that built the original railbed and returning it back towards its point of origin (original ground). Depending on the slope of the embankment, approximately 2 to 4' feet of width can be added for each foot of raising or lowering of the Bikeway. This approach offers both widening potential and improved access. Examples are shown in **Figure 50** and **Table 14** on the next pages.

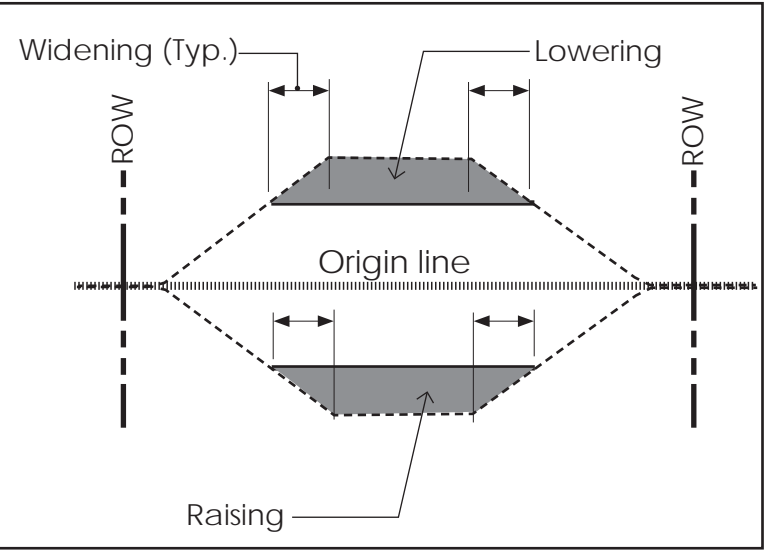
Although the corridor offers great promise, it is leased from the MBTA and subject to their review and potential future rail use. Ground manipulation will impact existing infrastructure (fiber optic line, bridges, etc.), vegetation, and involves handling soils that may require special attention due to the corridors previous railroad use. Bridges, in particular, may require removal or replacement depending on how the ground plane is manipulated. As such, this approach should only be proposed where it offers clear benefits.

Figure 48. Cut/Fill Diagram



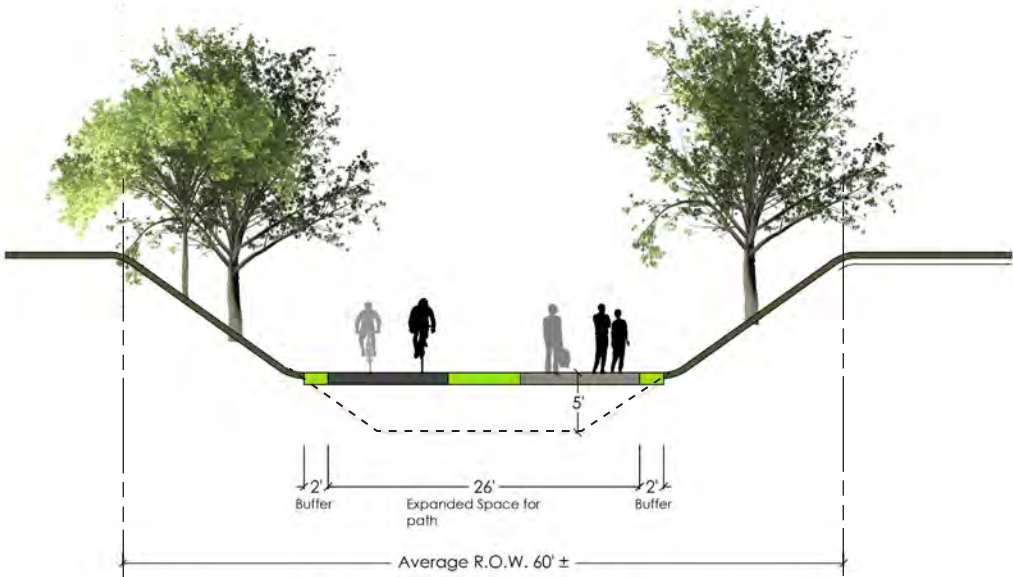
Typical cut/fill and the relation to the original ground plane (origin line).

Figure 49. Ground Plane Manipulation



Reversing the impacts of cut/fill to gain additional corridor width.

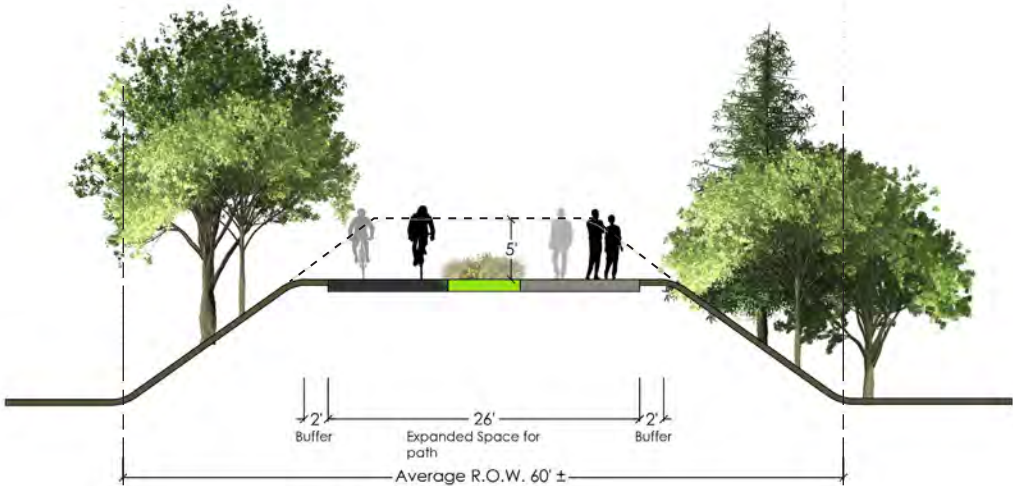
Figure 50. Typical Widening Options



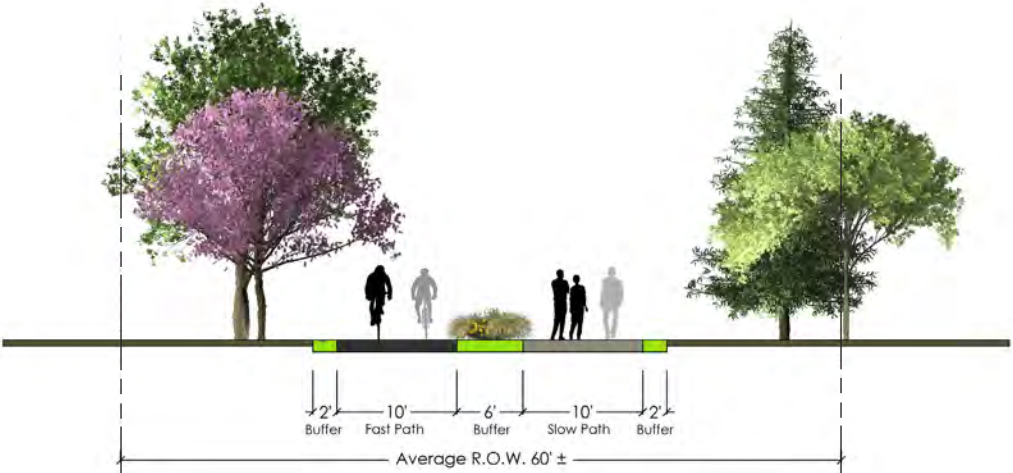
Adding fill in cut areas



Retaining walls



Cutting in fill areas



Widening in at-grade areas



Retaining walls, split paths

Table 14. Corridor Widening Examples

1. Fill with Cut

2. Cut with Fill

A.



Chicago 606
Image Source: <https://www.trailrunproject.com/trail/7013395/the-606-bloomington-trail>



Clipper City Rail Trail, Newburyport
Image Source: GPI

B.



Chicago 606
Image Source: <https://news.medill.northwestern.edu/chicago/the-606-is-pushing-up-real-estate-prices-along-its-path/>



Clipper City Rail Trail, Newburyport
Image Source: GPI

Multiple Treadways with Separation

One or more *treadways* (i.e., a portion of the pathway designated for a particular use) can be allocated to communicate direction or distinguish user types. A grouping of treadways - or *Multiple Treadways* - can be a successful design approach for heavily used corridors such as the Bikeway to provide greater safety and comfort.

Given its origins as a commuter bikeway, the Minuteman routinely experiences high speed bike traffic going to and from the MBTA Alewife Station. The addition of a separated sidewalk or pathway for pedestrians would be an appropriate improvement. There are several variations on the multiple treadway layout, with examples shown in **Table 15**:

- **Buffered Treadway** - a pedestrian path buffered from the Bikeway with pavement markings (1A), flex posts (1B), or different surface materials (1C).
- **Separated Treadways** - parallel paths for bike and pedestrian use (2A, 2B, 2C). This is similar

to the previously described options, but increases the separation distance and elevates the opportunity to create the feel of a linear park. These parallel paths can also be configured at different elevations (3A, 3B, 3C).

- **Serpentine Tracks** - parallel tracks that criss-cross or rejoin as needed to adjust to changing conditions along a corridor (4A, 4B, 4C).

RECOMMENDATION

The separation of user types into fast traffic and slow traffic is a desired approach to reduce conflicts along the Bikeway. Where widening potential allows for a Bikeway cross section of 14 to 18 feet, a Buffered Treadway treatment is most appropriate. Where widening potential allows for a Bikeway cross section of 18 feet or more, Separated Treadways may be considered to increase the sense of separation between user groups. Because the potential for widening varies along the Bikeway, there will likely need to be transitions between single and multiple treadways (Serpentine Tracks). With these transitions in mind, symmetrical widening that provides space for pedestrians on the outer edge of the Bikeway in both directions will provide more consistency than an asymmetrical approach.

Figure 51. Multiple Treadways with Separation

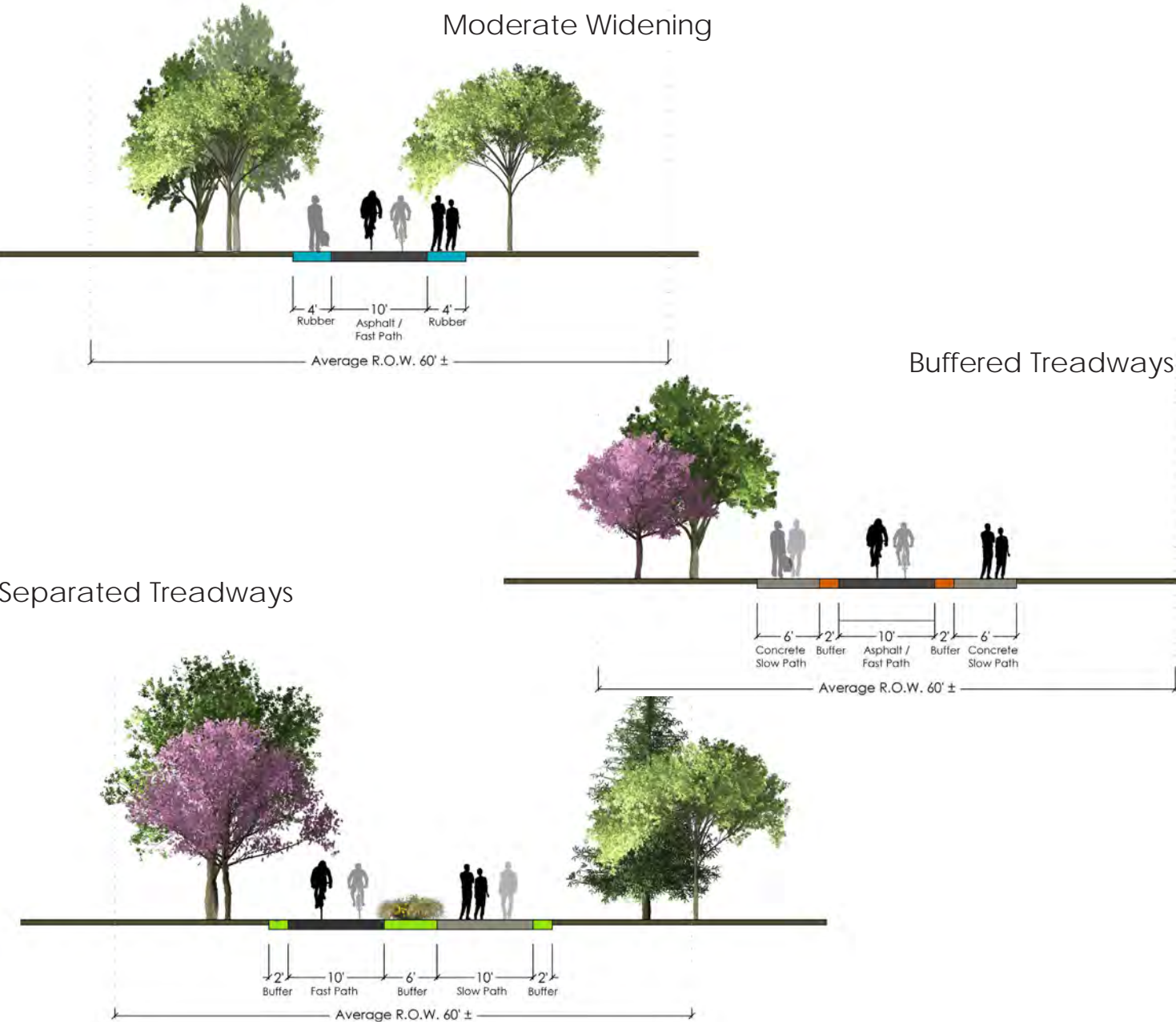


Table 15. Multiple Treadway Examples

1. Buffered

A.



Image Source: <https://www.trailink.com/trail-gallery/chandler-bike-way/>

B.



Image Source: <https://lh3.googleusercontent.com/l7Hss8lUPsc6Ux-lrB7OSq6o0FX2Jw2lIG4LQLnIFQ0a07XcHrsXfth9QKJLemjO1X372Z-bo=s113>

C.



Croatia
Image Source: <https://www.total-croatia-news.com/lifestyle/52309-city-of-split-bike-path>

2. Separated



Image Source: https://lh3.googleusercontent.com/Hpx-or5NbtTCTTDvW-MYp8r2XVDAu0rgKYv5_h3ByfduMCKSRcV-yic2p-pqPWVC0rQ3=s85



Image Source: <https://lh3.googleusercontent.com/dtD6Yq10frOHn-7hDpGlzC5z0nyPO7IVbG98Q3gIKwEFJsdjIHKoVBSEEJQABEb-vK3qh6w=s120>

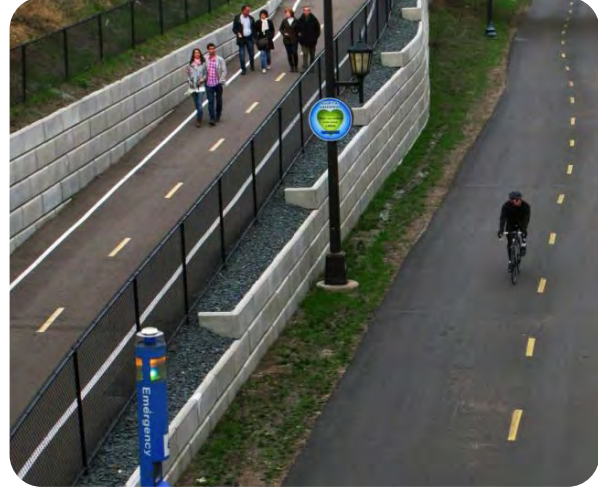


Image Source: https://lh3.googleusercontent.com/q14LI-LuKR5tT5cIPQXTOWT7xGp74VQjX261qQ_ziWNHypALL7A_JWw7_49zx-rYofLJSxqQ=s113

3. Grade-Separated



Image Source: http://www.pedbikesafe.org/bikesafe/countermeasures_detail.cfm?CM_NUM=31



Minneapolis Midtown Greenway
Image Source: <https://www.twincities.com/2019/06/10/cost-to-extend-minneapolis-midtown-greenway-to-st-paul-7m-to-27m-depending-on-this-bridge/>



Waterfront Promenade
Image Source: <https://www.pinterest.com/pin/765612005374063468/>

4. Serpentine

A.



Bow Riverwalk
Image Source: <https://marmotconstruction.com/project/riverwalk-stage-1-phase-1-3/>

B.



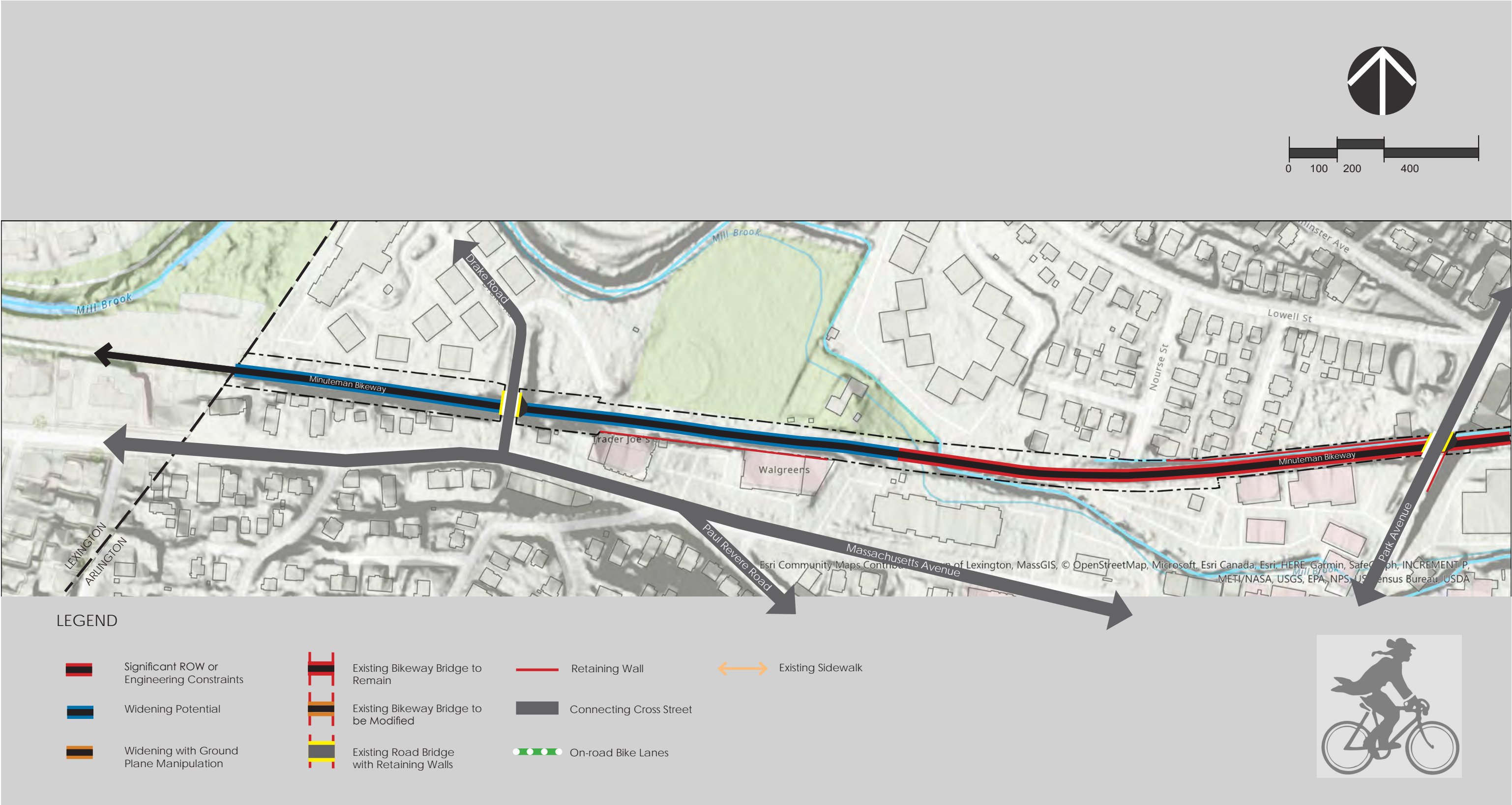
Image Source: <https://www.re-thinkingthefuture.com/architectural-community/a5003-career-guide-landscape-architecture/>

C.

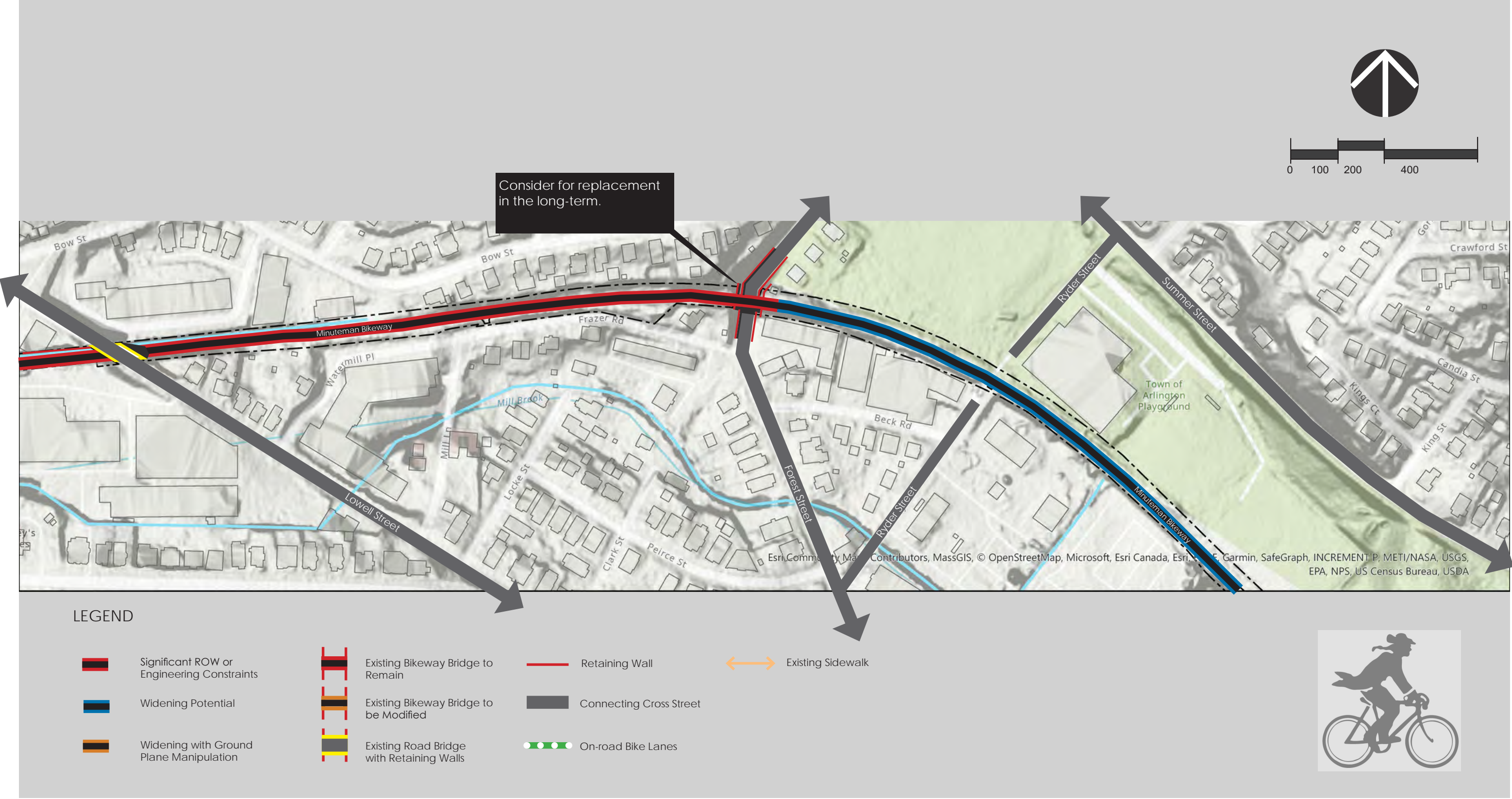


Image Source: <https://lh3.googleusercontent.com/lAmfPBiO-Akn5paR13stYdu3D97UiHEGAK5XO10YG7U-e4KrTVqlyfYBnE-Jq-xbmXvEuFM6c=s85>

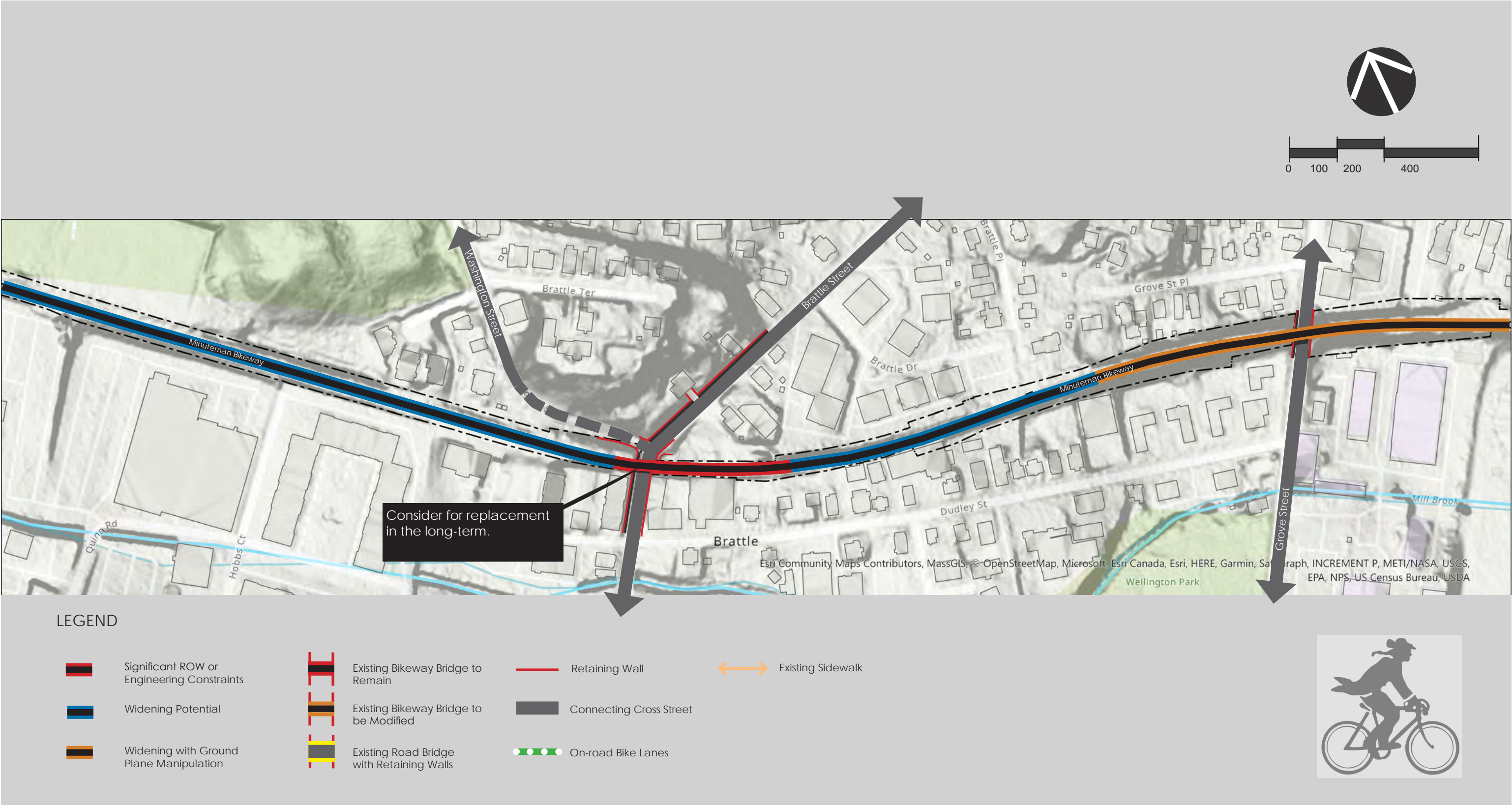
Figure 52. Potential Corridor Widening
Lexington Border to Park Avenue



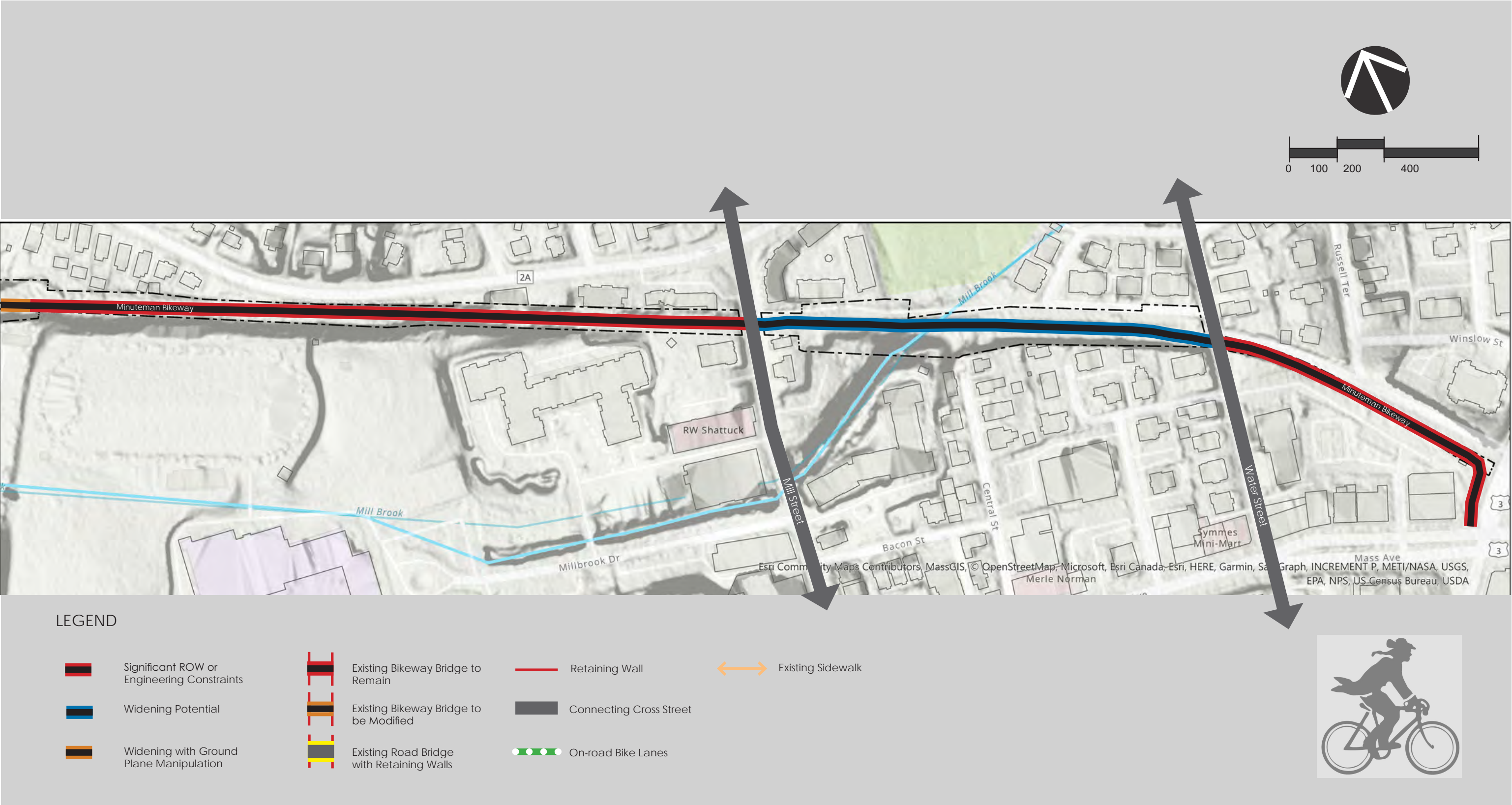
Lowell Street to Hill's Hill



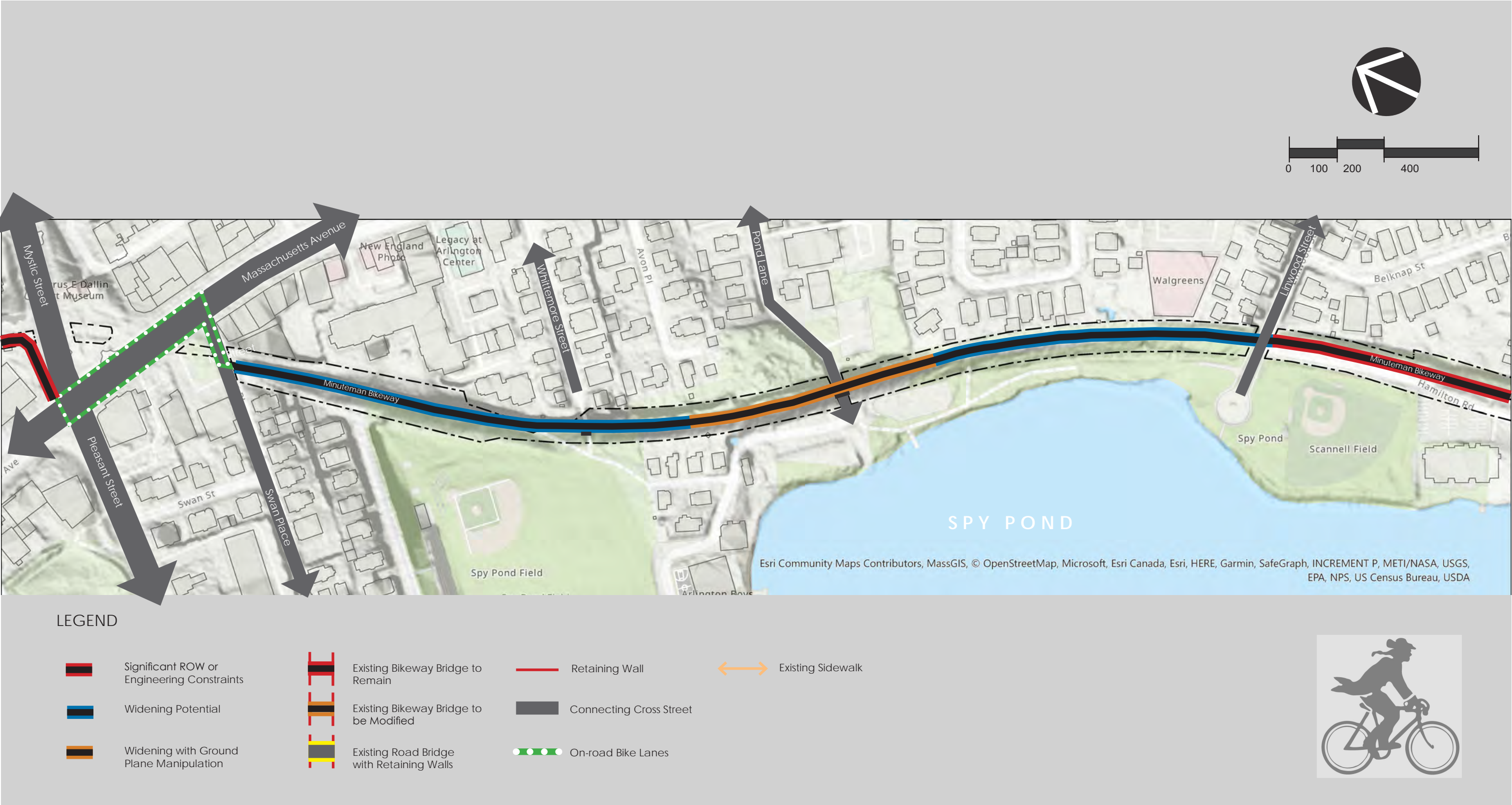
Hill's Hill to Grove Street



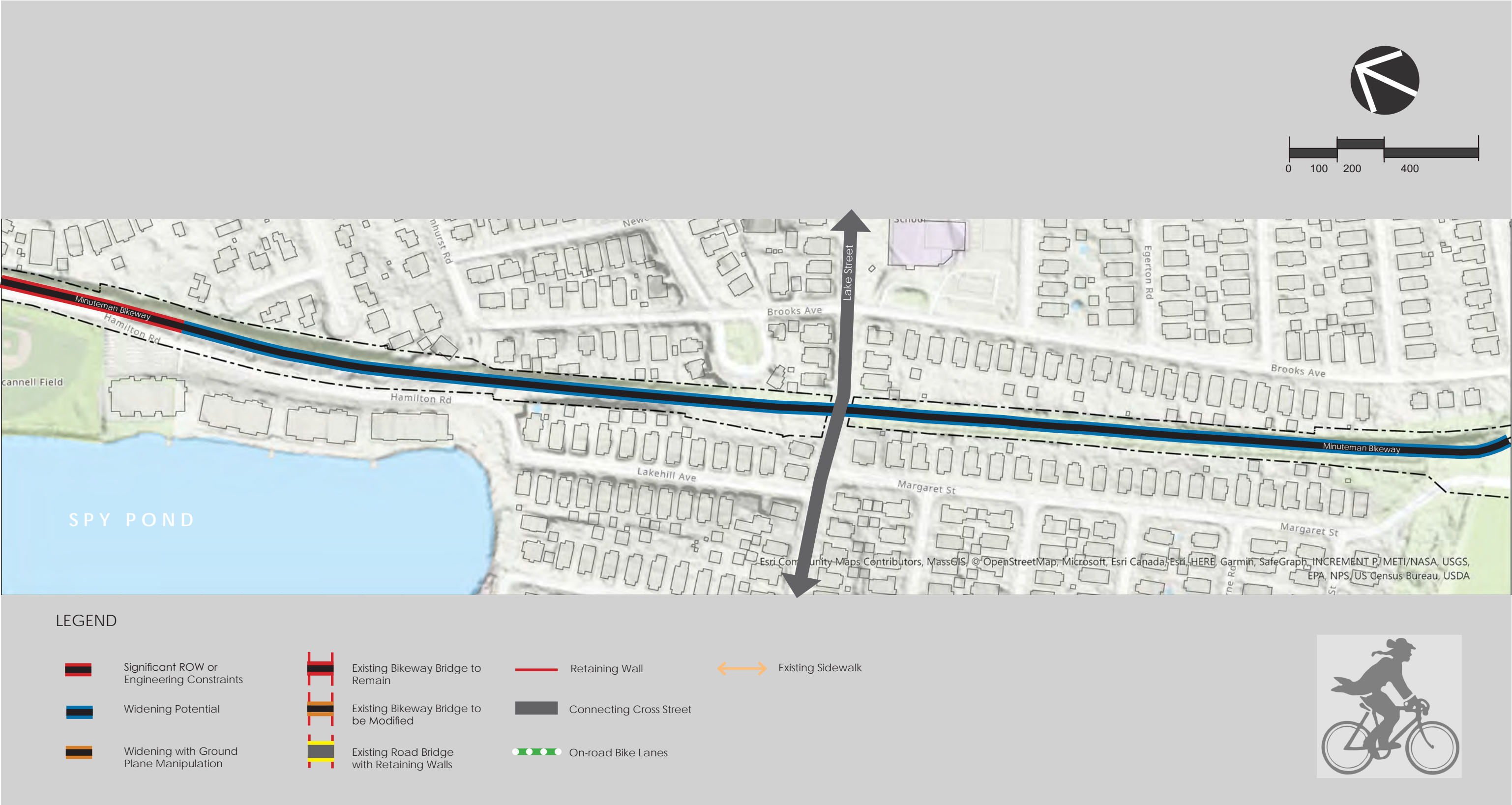
High School to Mystic Street



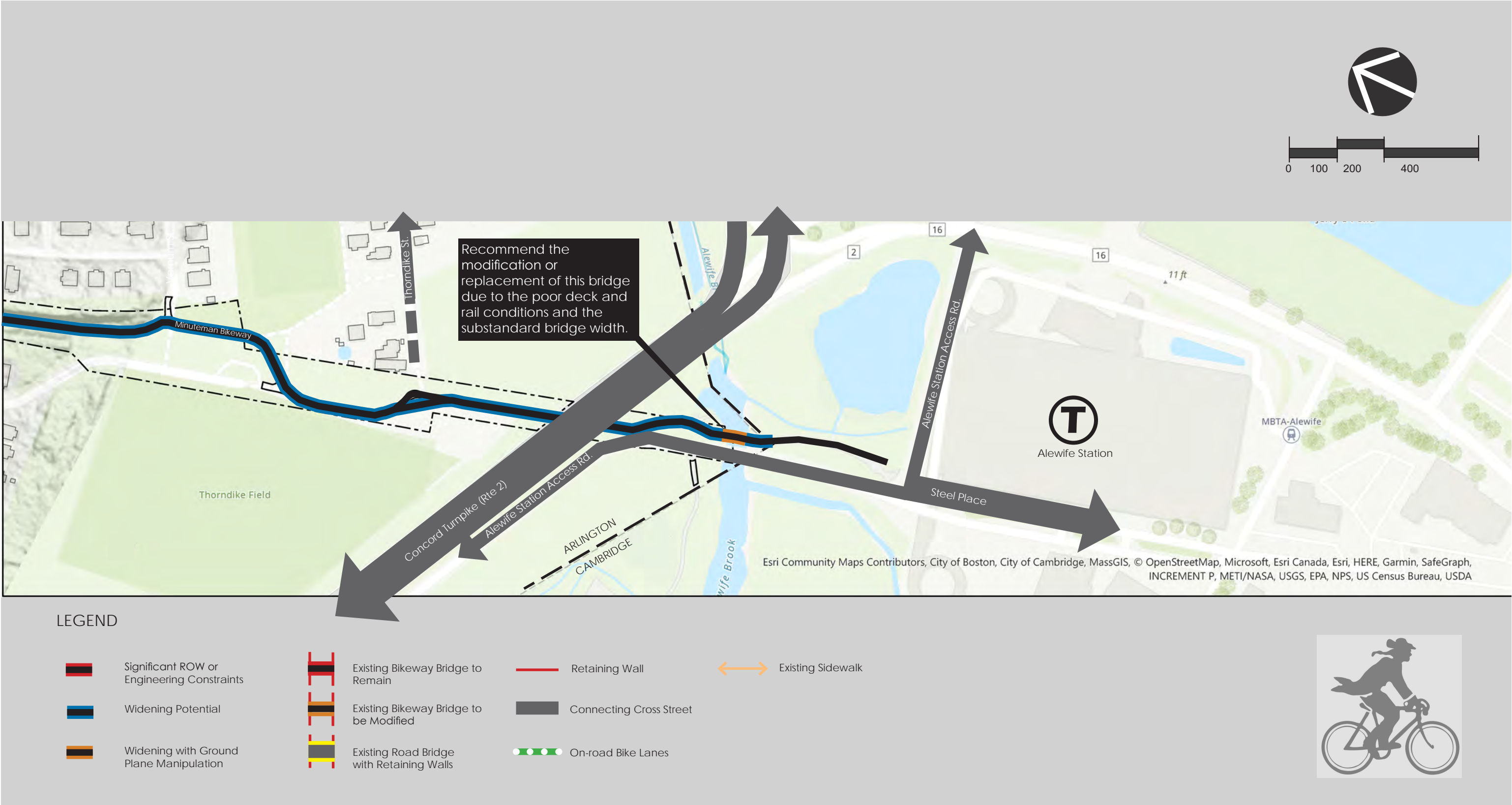
Mystic Street to Scannell Field



Scannell Field to Thorndike Field



Thorndike Field to Cambridge Border



Establish User Envelopes

Engineering and right-of-way constraints limit opportunity to widen the Bikeway. As an alternative or as an interim treatment to widening, a mix of etiquette signage and pavement markings can be used to establish clear path user envelopes to separate users of different needs and speeds and to clarify behavior such as passing.

Chapter 3 outlines policy recommendations for updating and communicating expected user etiquette on the Bikeway. The existing etiquette guidance provides a sufficient baseline, but there are opportunities to clarify permitted uses, passing etiquette, and guidance for pets and children on the path. Updates to these areas, in particular, will aid in better establishing user envelopes and expected paths of travel. In addition to updating guidance, it is recommended that signs outlining user etiquette be posted at more regular intervals along the Bikeway. Simple graphics and larger text should be considered so that signs are legible to passing users, especially bicyclists.

The use of pavement markings and striping can also help users share space effectively. The Arlington section of the Bikeway currently features a dashed yellow centerline which delineates travel lanes and provides a guideline for user placement. The dashed markings communicate to users that it is acceptable to shift into the opposing lane briefly when passing other users. On approaches to intersections or on shorter segments of the Bikeway between crossings, the centerline is solid, demonstrating that users should not pass in those locations. At the Lake Street Crossing, additional pavement markings and signage direct bicyclists to the left, so they may cross at the bicycle signal, and pedestrians to the right, so they may cross at the crosswalk.



Figure 53. Existing pavement markings on the Bikeway

In other states, path users are expected to adhere to the same right of way principles as roadways: pedestrians keep to the left, facing in the direction of travel, and bicyclists keep to the right. This approach places slower-moving pedestrians in a direct line of site of oncoming bicyclists, but there are disadvantages to this system. A lack of clear understanding, people walking or riding two-abreast, and crowding can lead to conflicts between users traveling in different directions. When multiple pedestrians and bicyclists traveling in different directions happen to reach the same location at the same time, there is no clear yielding pattern, which can lead to confusion and potentially unsafe conditions, particularly for people with visual or cognitive impairments.

RECOMMENDATION

Considering the current practices and pavement markings on the Bikeway, it is recommended that a “keep to the right” policy be maintained and that the yellow centerline be preserved along the length of the Bikeway to manage space effectively. This policy can be emphasized through the application of pavement markings and signs at key locations to communicate that slower moving users (e.g., people walking) should stay to the outside.



Figure 54. An example of pavement markings that could be applied to the Bikeway to delineate where pedestrians and bicyclists are expected to travel within the path envelope (Kittelson & Associates, Inc.)

Traffic Calming

Speed and demand management can also be accomplished through infrastructure design. Similar to traffic calming measures for vehicles, design elements can be added to shared use paths that encourage slower traveling speeds and increased caution. These include added curvature or deflections at intersections, additional striping or pavement markings, and surface treatments. Speed management is most effective when policy is paired with complementary traffic calming design strategies.

Added curvature, or chicanes, should not decrease sight distance or make conditions unsafe for faster users, but they can help to slow bicyclists and decrease user conflicts by requiring more intentional movement along the path. At intersections, bicycle roundabouts or added deflection, can be used calm speeds as users enter or exit the Bikeway.



Figure 56. Added curvature on a bicycle facility



Figure 55. Bicycle Roundabout (VDOT)

Striping and pavement markings, as described above, also play an important part in encouraging slower speeds, since they delineate expected user envelopes and encourage careful passing. Surface treatments, such as textured pavement or speed bumps, can help to decrease speeds, but should be used sparingly as they can detract from users' experiences, pose ADA issues, or lead to the establishment of alternative routes avoiding the treatment.



Figure 57. Bicycle rumble strips designed to slow bicyclists (Joe Linton)



Figure 58. Examples of transverse pavement markings used on roadways to encourage slower speeds (Neal Hawkins and Joshua Ng Yew Wei, et al.)

Pavement markings can also be used to emphasize target areas for traffic calming in conjunction with other approaches. Transverse pavement markings, for example, are used to give drivers – or other modes – the perception of moving faster. These markings are applied at emphasis areas such as the approach to a crosswalk or intersection or prior to and through curves or hills. On the Minuteman Bikeway, these could be applied at approaches to at-grade crossings.

RECOMMENDATION

Consider incorporating design elements that manage speeds in conjunction with other construction opportunities such as repaving, the design of new access points, or widening. Traffic calming at approaches to crossings and access points is most relevant on the eastern half of the Bikeway where the path is at-grade with the surrounding network. Traffic calming along the corridor is most relevant on the western half of the Bikeway where there are few intersections and people biking are able to build up speed.

Improve Safety and Comfort on Parallel Routes

The Bikeway is a much-loved and used community asset but it has been expected to meet a widely divergent set of needs for large volumes of users. Ultimately, the Bikeway cannot be everything to everyone. However, rather than restricting use of the publicly-owned community asset by certain modes or types of users, the Town should leverage the popularity of the Bikeway as a means to develop other high comfort routes that will allow path users to filter onto parallel routes. Massachusetts Avenue runs roughly parallel to the Bikeway through the full extents of the Town and is a prime candidate for improved bike facilities.

The expansion of Arlington's bicycle network will enable users to select from a range of routes when reaching common destinations and in turn, help to manage user demand and speeds, especially during peak travel times. The improvement of parallel routes will also enable better connections with surrounding neighborhoods, local businesses, and transit stops.

ACCESS POINTS, WAYSIDES AND TRAILHEADS

Existing Conditions

Comprised of both at-grade and grade separated intersections, the physical makeup of the Bikeway presents a variety of built-in constraints and contradictions that make for challenging access.

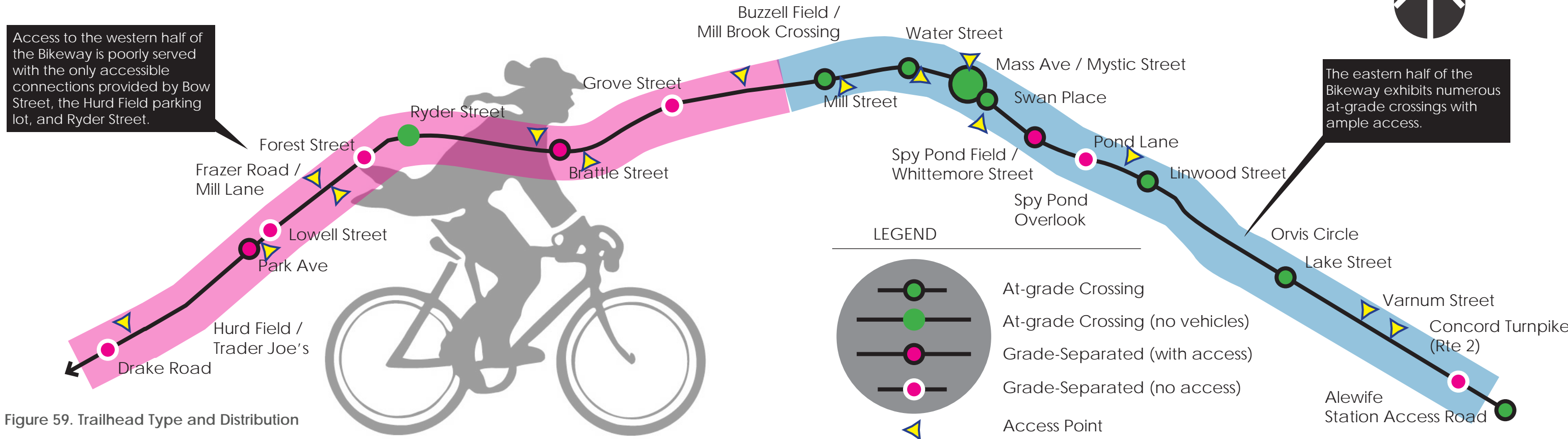
At-Grade Crossings

The Bikeway crosses eight streets, as represented by the green dots in **Figure 59**. These include five local streets (Lake Street, Linwood Street, Swan Place, Water Street, and Mill Street) and the complex Massachusetts Avenue/Mystic Street intersection.

These at-grade street crossings allow users easy access and egress from neighboring streets and promote neighborhood connectivity – which is of vital importance to achieving the greatest and highest use of the path network. However, at-grade crossings bring bikes and pedestrians into conflict with vehicles and must employ appropriate safety measures. This type of crossing is most appropriate on quiet local streets.

Grade Separated Crossings

The Bikeway also includes nine grade separated crossings, represented by the pink dots in **Figure 59**. These include eight local streets (Drake Road, Park Avenue, Lowell Street, Forest Street, Brattle Street, Buzzell Field / Mill Brook Crossing, Water Street, and Mass Ave / Mystic Street) and the complex Massachusetts Avenue/Mystic Street intersection.



Grove Street, Whittemore Street, and Pond Lane) and Route 2. Only three of these crossings offer any form of access/egress, which is represented by the black dot perimeter.

Grade separated crossings allow efficient passage and minimal vehicle/pedestrian conflicts, but are often isolated from their surroundings. These are most appropriate at intersections where high traffic volumes or speeds exist (such as the Concord Turnpike/Rte. 2 crossing).

Unbalanced Network

Designed within the context of the railroad line, the Bikeway re-purposed the corridor with minimal changes to its infrastructure. **Figure 59** clearly illustrates the wide use of at-grade crossings along the eastern half of the project corridor, while the western half is predominately comprised of grade-separated crossings. Generally, this suggests that the eastern half may experience greater conflicts with traffic - a conclusion supported by the crash results presented in **Appendix A**. Conversely, the western half does not experience any conflicts with cross traffic, but relies more heavily on small entry points from local side streets and private property to access the Bikeway.

Contradictions in Application

Arlington was first settled in the 1600s, while the railroads were generally constructed in the late 1800s. The use of an at-grade crossing at Massachusetts Avenue/Mystic Street and Lake Street likely reflects both topography challenges and also the fact that the railroad was inserted into the Town's existing street grid using the least invasive methods possible. In contrast, the western half of Arlington developed the more rural edges of the Town where there was greater flexibility and room to install (what would have been state-of-the art) grade separated crossings. The historical development of the corridor has resulted in grade crossings at some of the quietest streets, while some of the busiest crossings are at-grade.

Figure 60. Potential Access Improvements

Lexington Border to Park Avenue

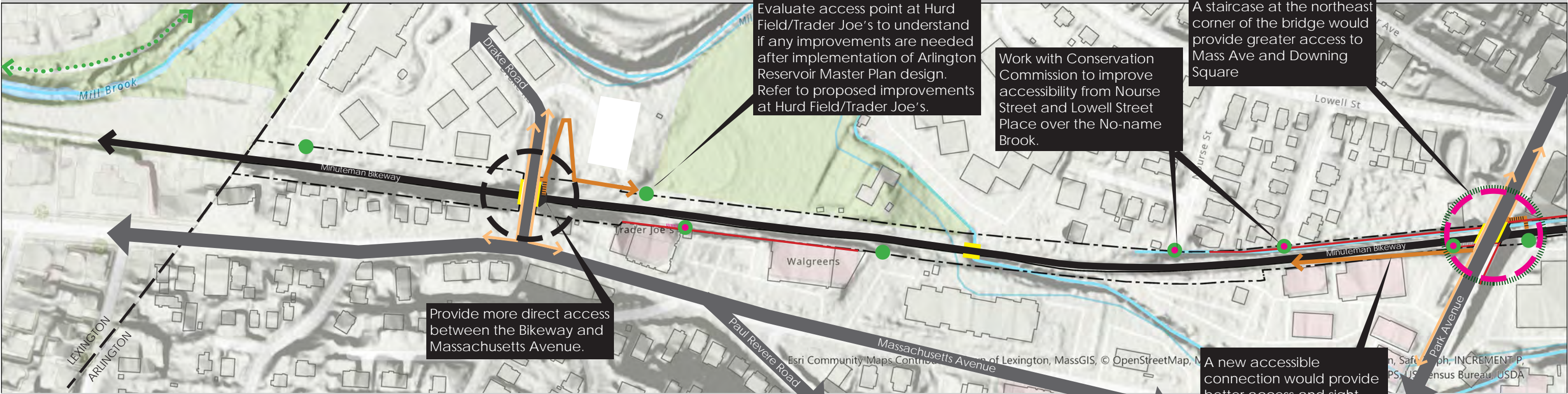
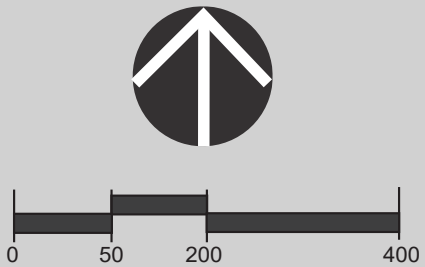
RECOMMENDATION

The following plans show potential access improvements with an eye towards improving connectivity and accessibility.

The level of access improvements must be coordinated with existing conditions and other planned improvements.



Excerpt from Arlington Reservoir Master Plan



LEGEND



Intersection with Access & Barrier Free Route*
Intersection with Access but Non-accessible
Intersection with No Access

Note: Outer ring represents general access of any form (stairs, footpath, etc.)
Inner ring represents barrier free access for pedestrians and bikes.
(green = yes, red = no).

* Barrier free does not necessarily mean compliant with current access standards

Minor Access & Barrier Free*
Minor Access / Non-accessible

Existing Bikeway
Existing Bikeway Bridge with Retaining Walls
Existing Road Bridge with Retaining Walls

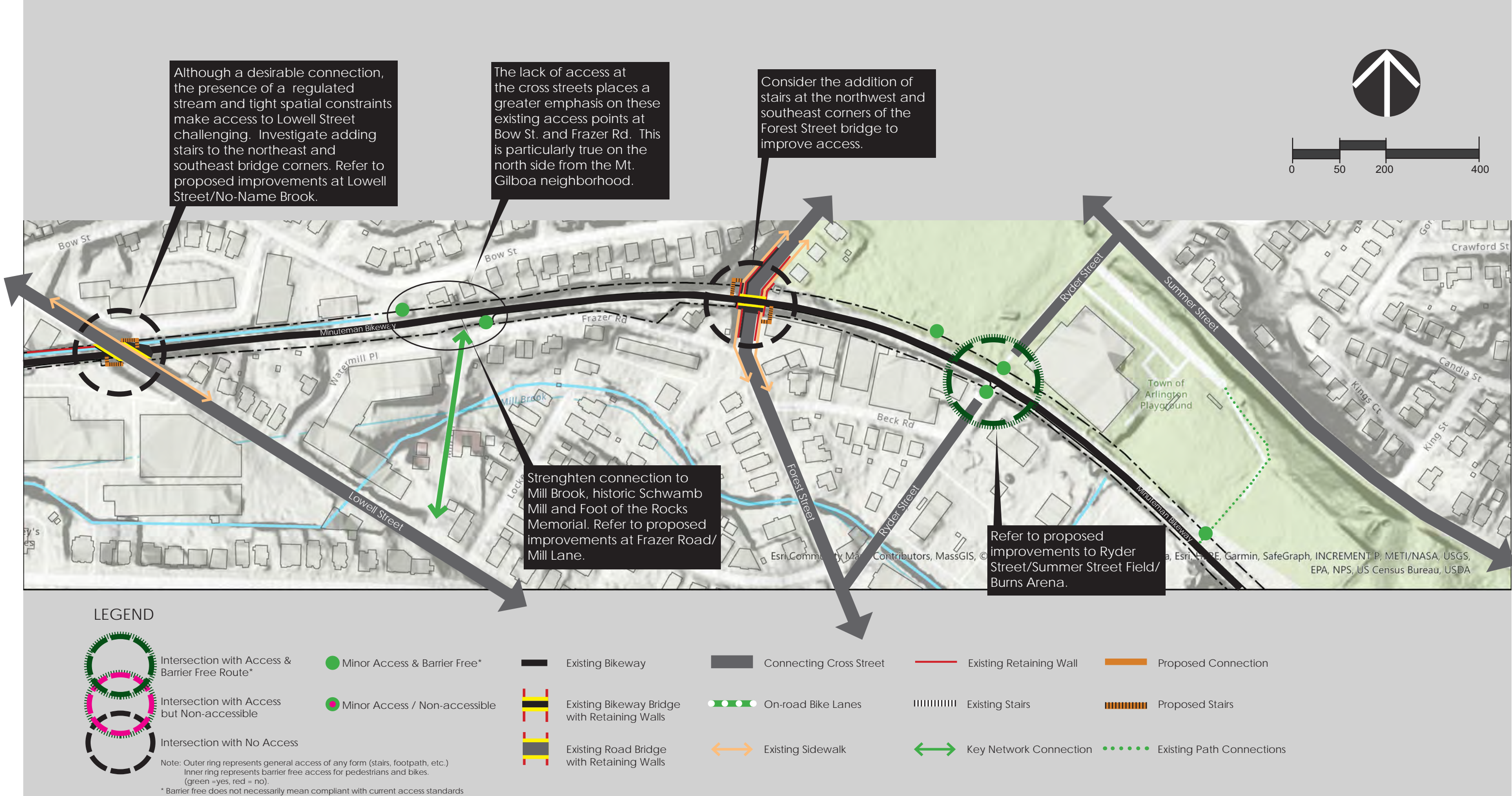
Connecting Cross Street
On-road Bike Lanes
Existing Sidewalk

Existing Retaining Wall
Existing Stairs
Key Network Connection

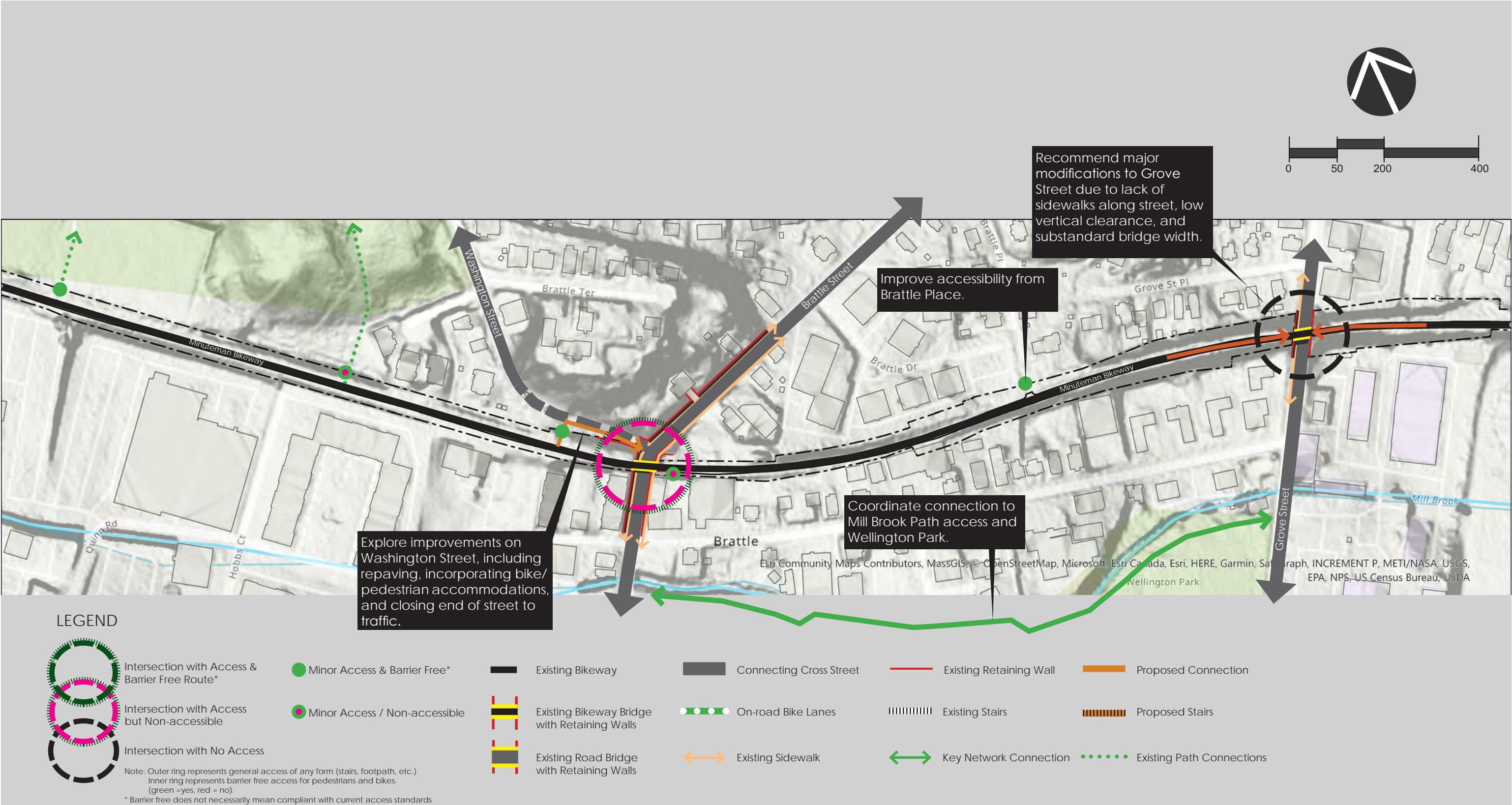
Proposed Connection
Proposed Stairs
Existing Path Connections



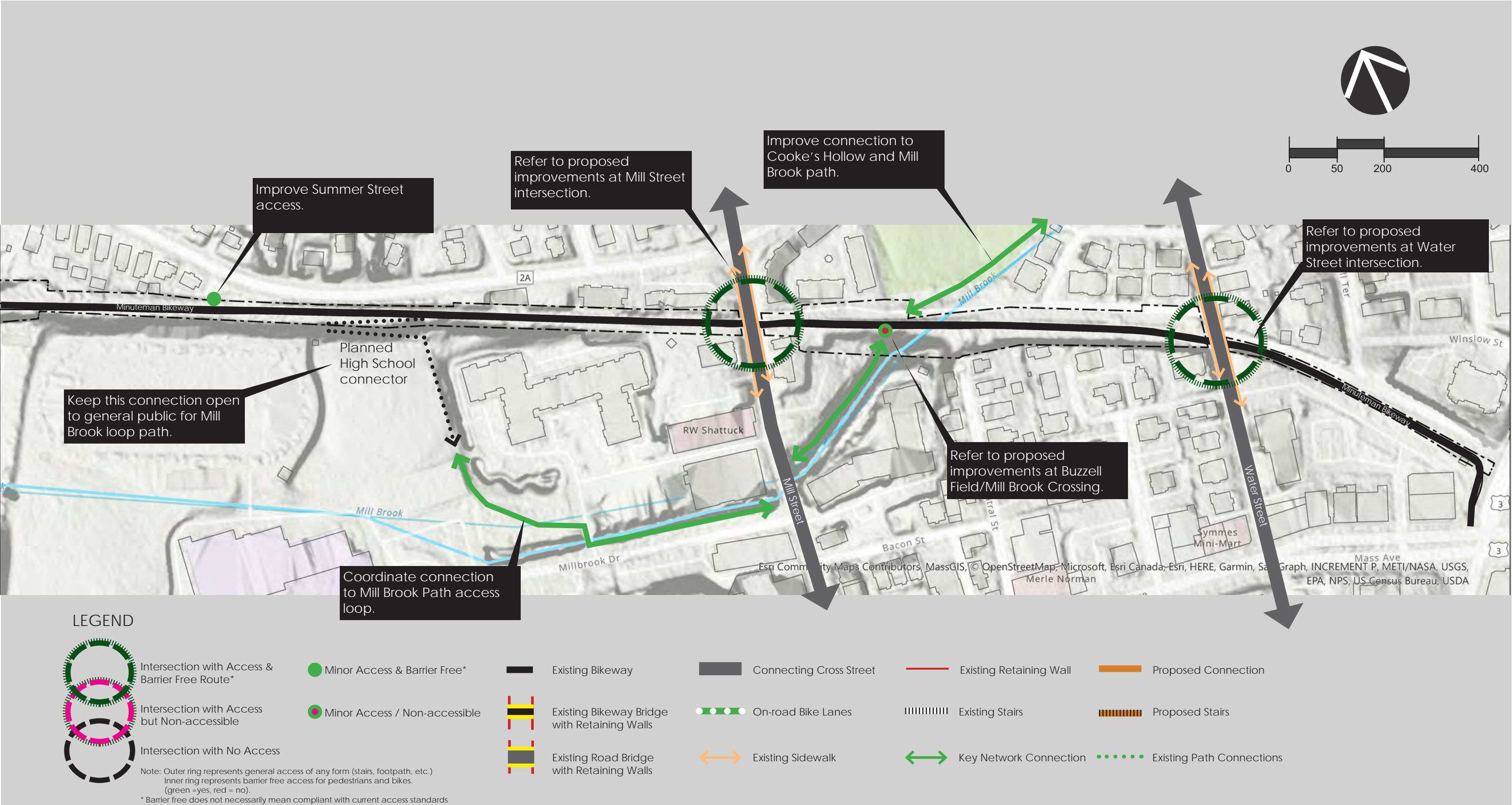
Lowell Street to Hill's Hill



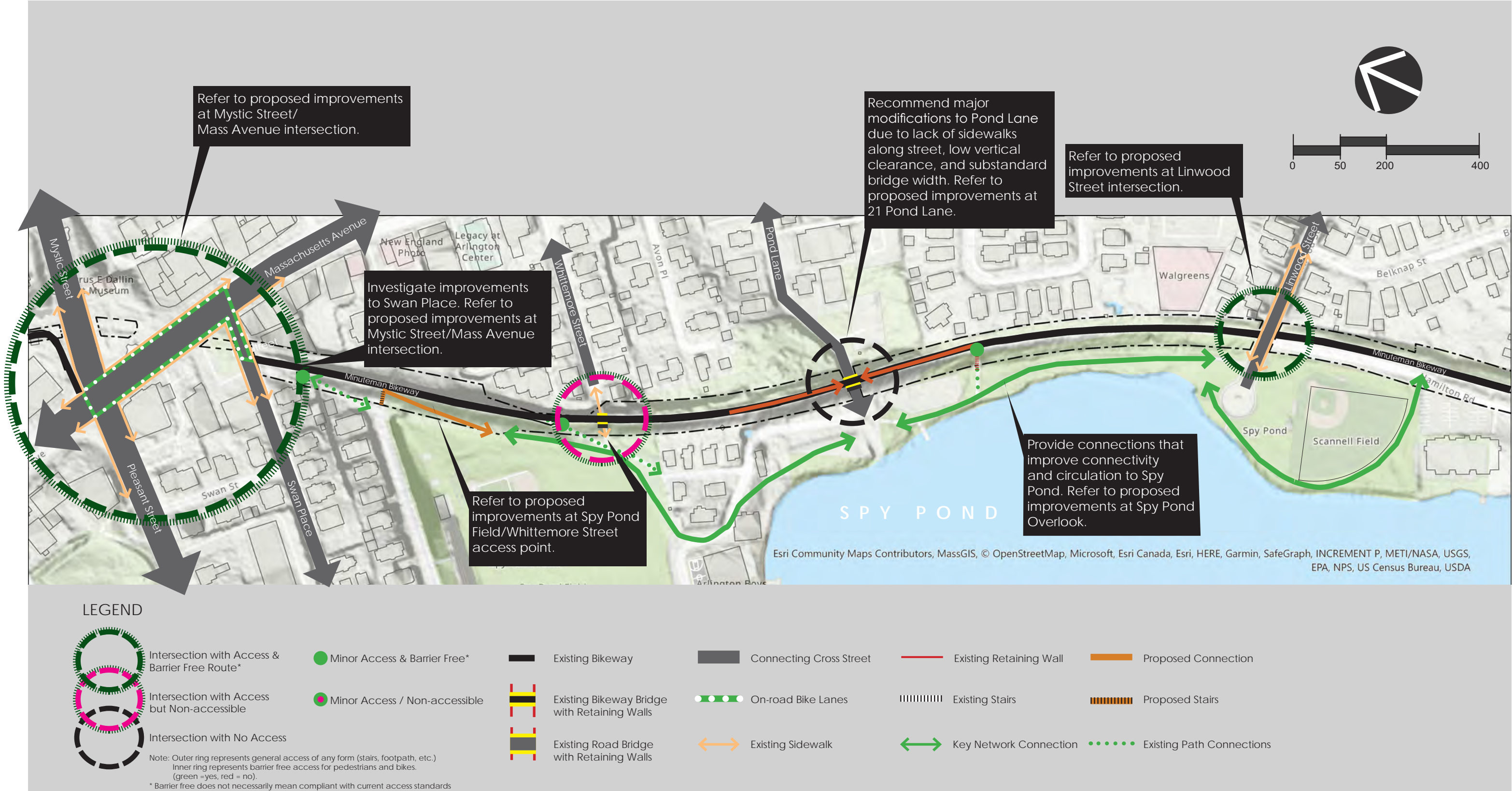
Hill's Hill to Grove Street



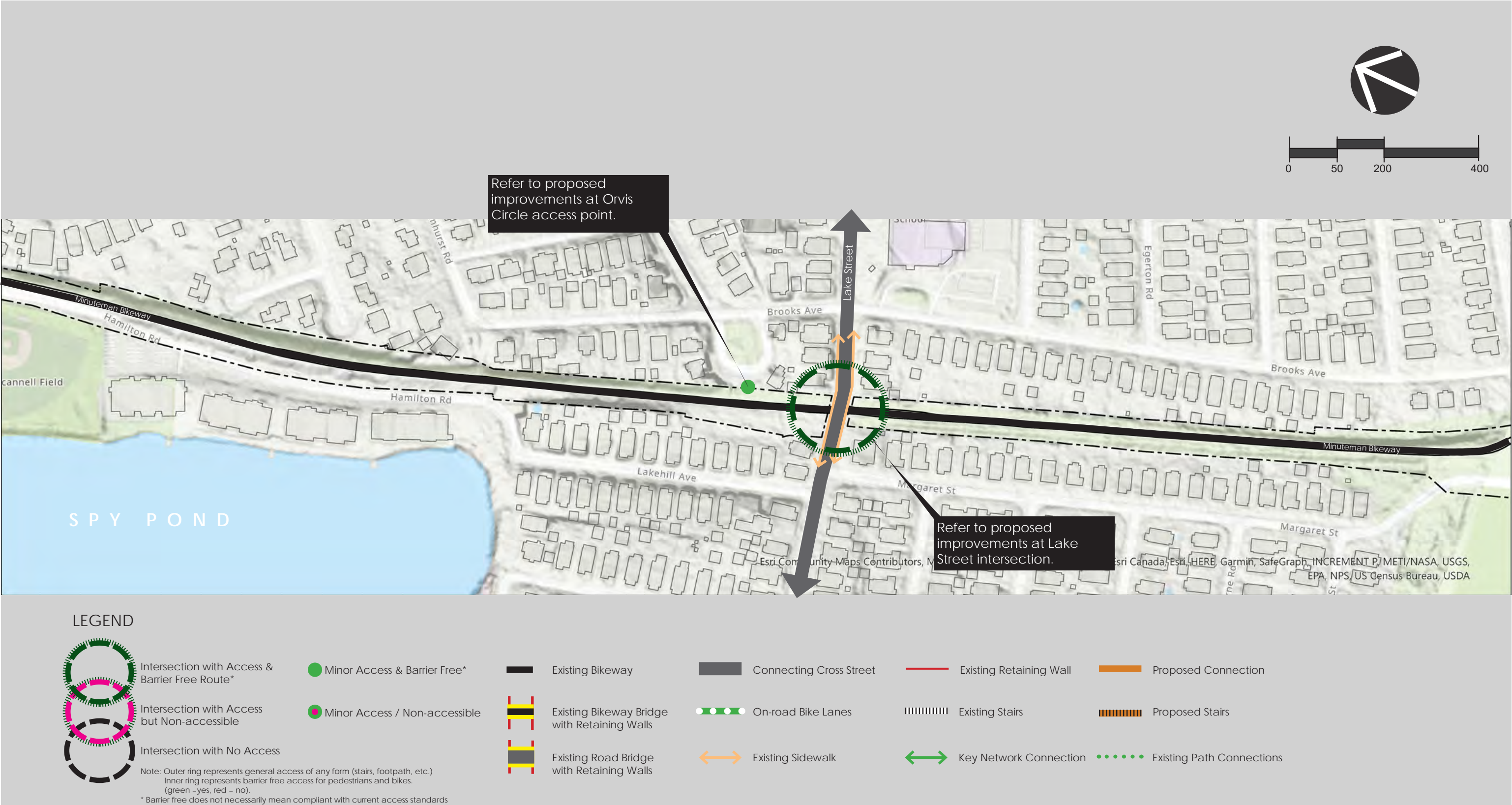
High School to Mystic Street



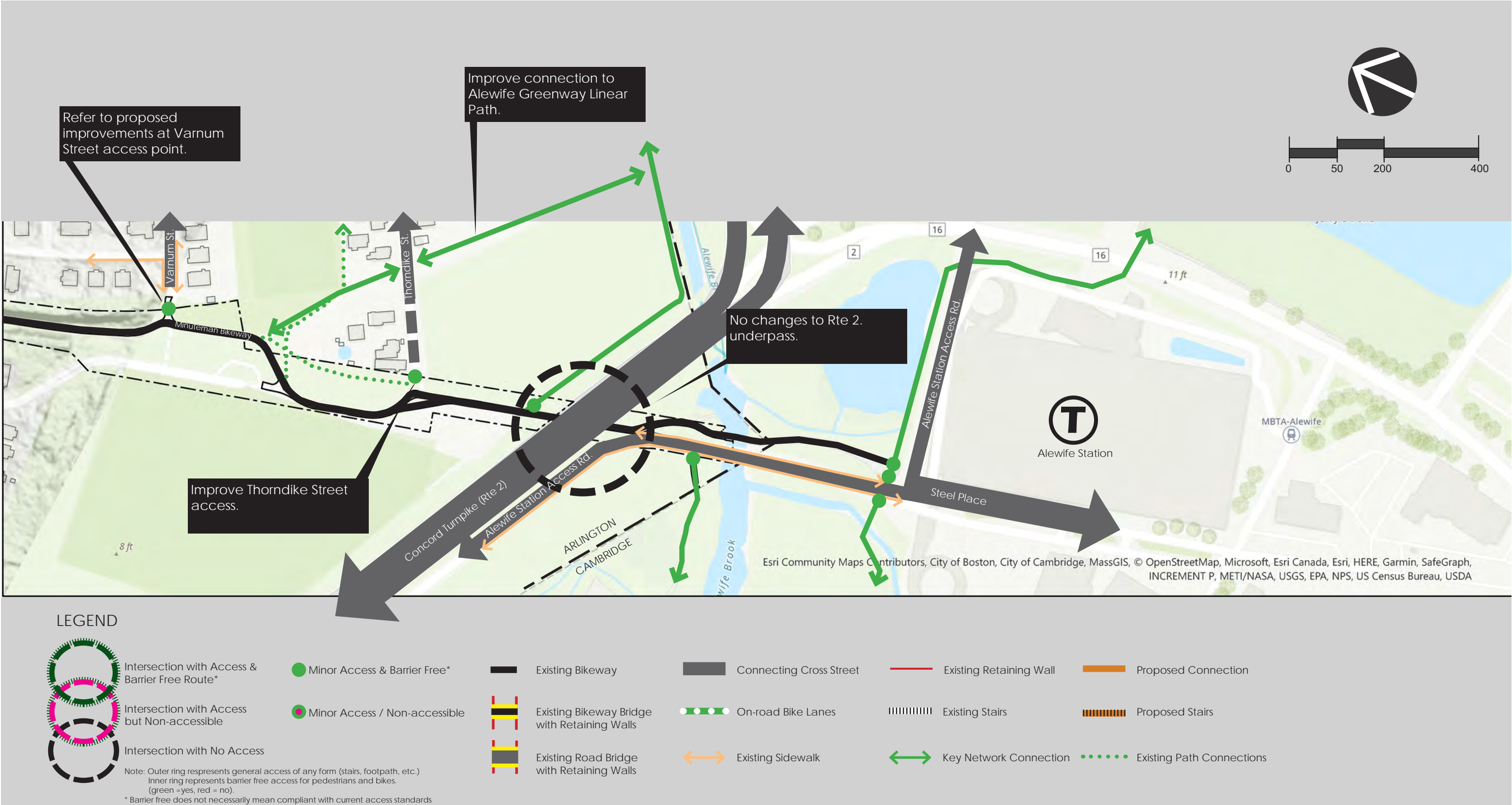
Mystic Street to Scannell Field



Scannell Field to Thorndike Field



Thorndike Field to Cambridge Border



Waysides and Trailheads

This section identifies specific recommendations for a selection of trailheads and waysides along the Bikeway. These include the at-grade street crossings as well as other access points and proposed wayside locations.

Placemaking Opportunities

The Bikeway has a host of interesting cultural and historic aspects that lend themselves to creative placemaking and are considered throughout the recommendations for waysides and trailheads. For instance:

- The Bikeway twice crosses the Mill Brook - the very stream the Town was built around. Many mills, which once harnessed the power of this swift moving stream, and portions of the brook are still to be found within reach of the Bikeway.
- The fight for freedom during the Revolutionary War took place nearby along Massachusetts Avenue, including the Foot-of-the Rocks battle.
- The birth and decline of the railroad helped shape the current trail and there are still a few extant elements from the railroad (namely the bridges).

Figure 62. Schwamb Mill Site Plan

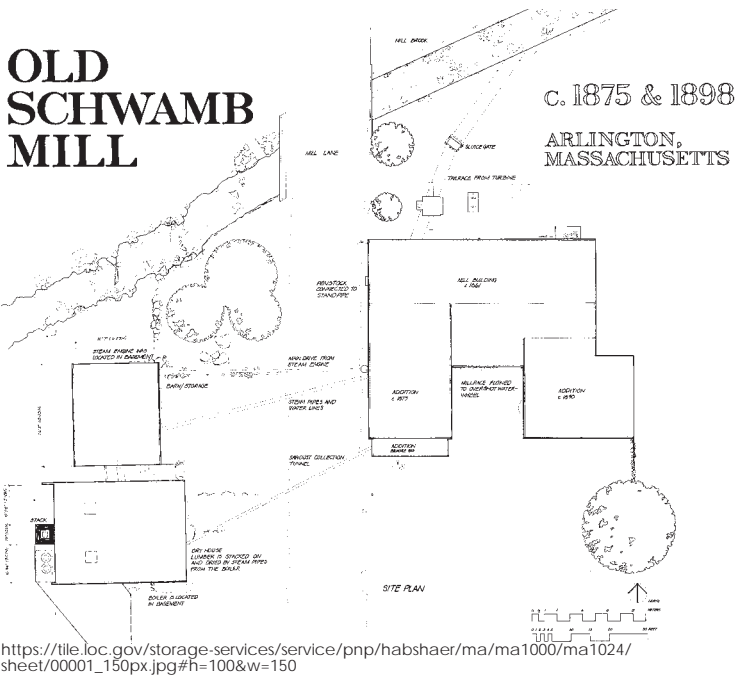


Figure 63. Foot of the Rocks Marker

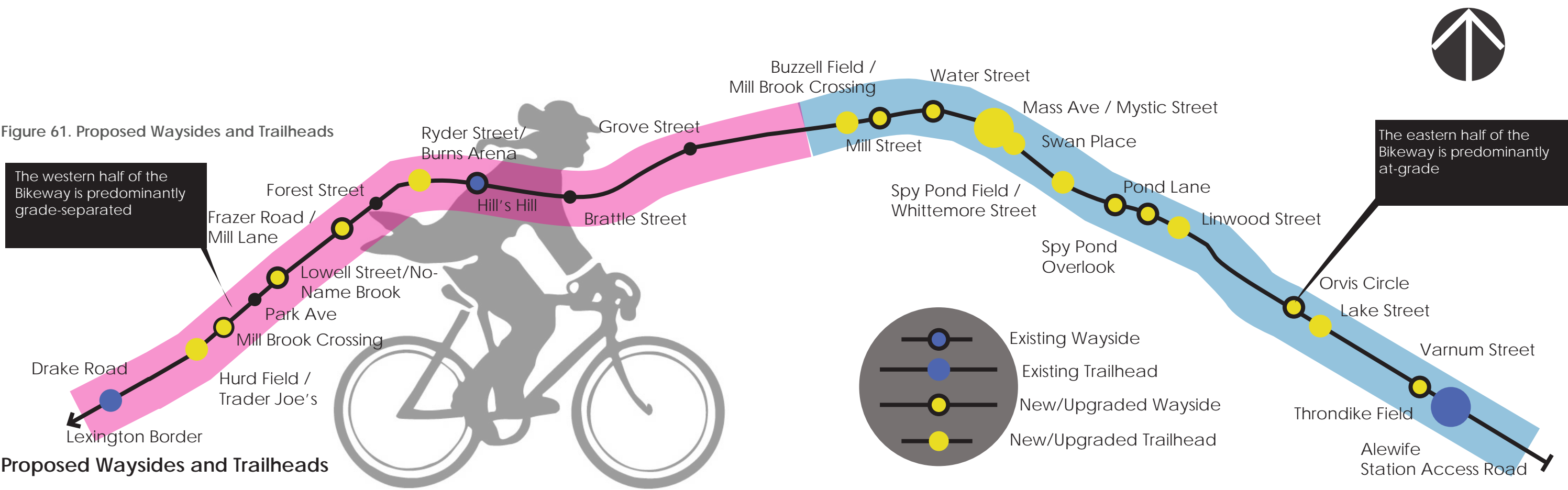
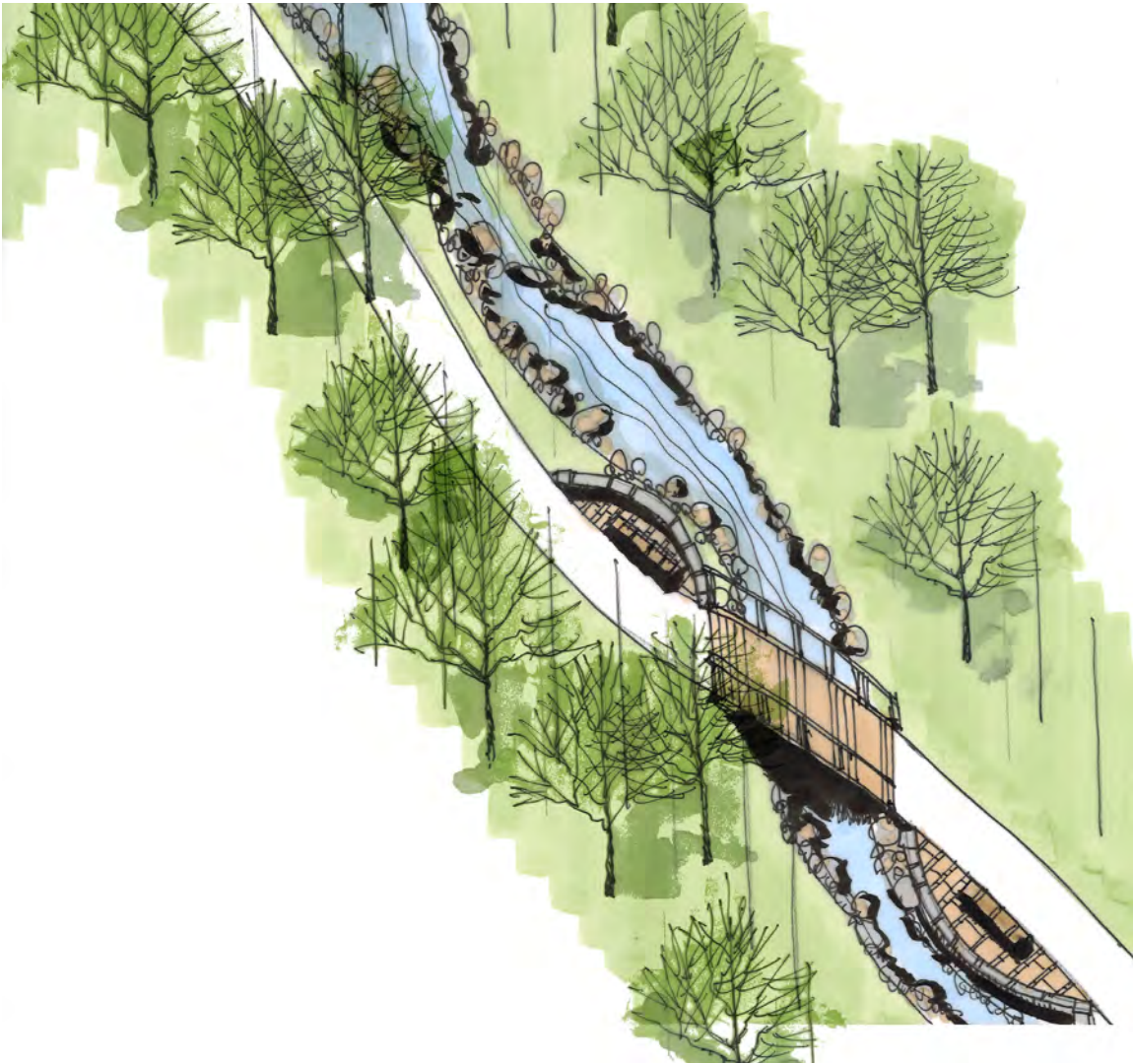


Figure 61. Proposed Waysides and Trailheads

Figure 64. Existing Mill Brook Crossing



Figure 65. Conceptual Sketch - Mill Brook Crossing



Mill Brook Crossing

This is the first of two locations within the Mill Brook Valley where the Minuteman Bikeway crosses the Mill Brook. Guarded by high fencing and guardrail, the brook is neither visible nor accessible. The Mill Brook has been highly studied over the years - (1926 report by Charles Eliot II, 1975 Arlington Center-Mill Brook Valley Plan, 1977 Mill Brook Linear Park by Mia Lehrer, 2010 Mill Brook Linear Park Report, and 2019 Mill Brook Corridor Report) and some type of restoration effort here would combine several initiatives and make for a meaningful wayside.

RECOMMENDATIONS

- Remove the 90-degree bends in the brook and eliminate the concrete channels. Allow a more relaxed alignment that connects either end of the stream channel through the former rail corridor.
- Shift the path alignment approximately 600-feet towards the southerly side of the corridor to allow the new stream alignment.
- Construct a new footbridge and overlook seating that provides a visual connection to the brook.
- Celebrate the brook for all that it has done over the years for the Town.

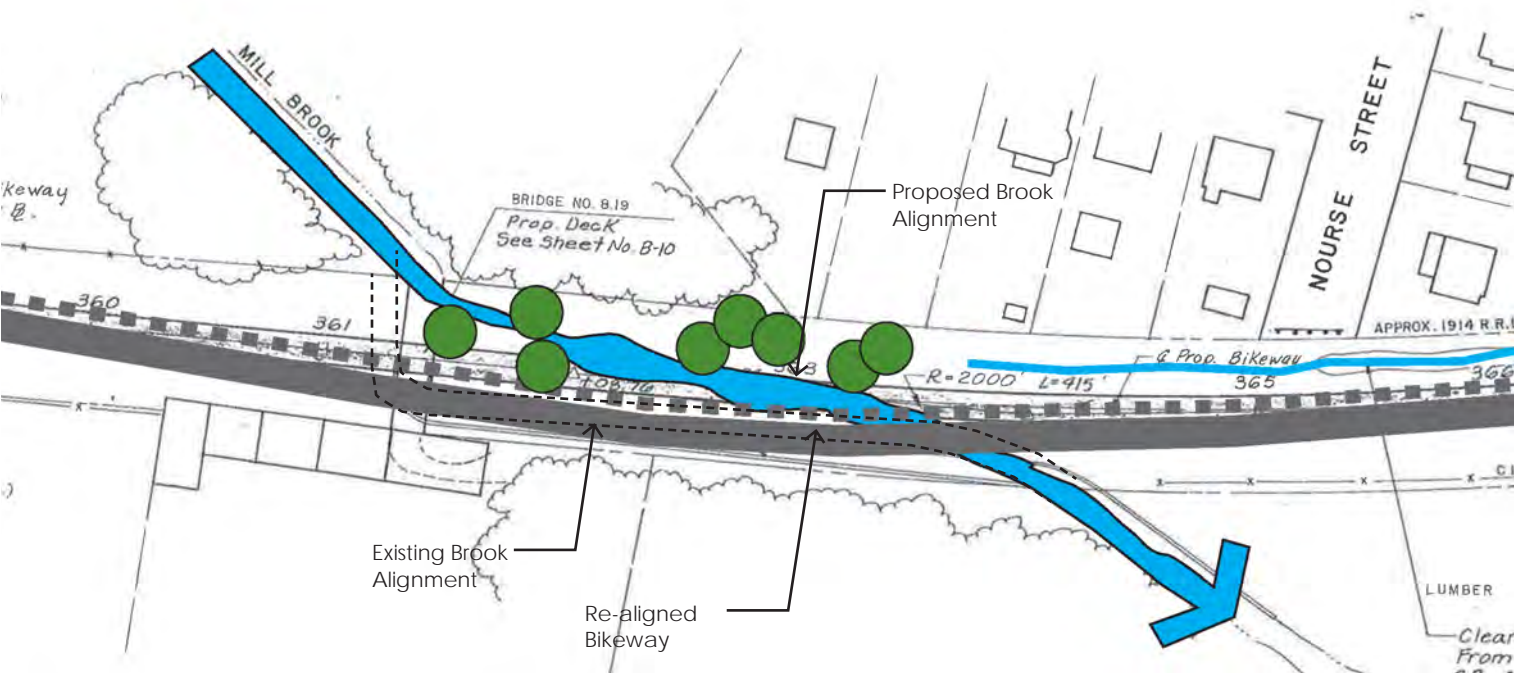
WAYSIDE COMPONENT OPPORTUNITIES

- Interpretive kiosk wayfinding
- Seating
- Views
- Pull-off area
- Cultural, historical, or educational exhibits
- natural areas

NEXT STEPS

Internal discussions with Mill Brook Team and Conservation Staff. Modifications to lease. Survey and Design.

Figure 66. Schematic Plan of Improvements - Mill Brook



Lowell Street / No-Name Brook

Approximately 50 feet in width, the Lowell Street underpass accommodates both the Minuteman Bikeway and what is locally known as the No-Name Brook. This unique combination of the path and brook could become a photographic location along the path. The restoration of the No-Name Brook - namely removal of the Japanese Knotweed - would greatly improve the character and quality of this stretch of the Bikeway from Nourse Street to Craig’s Landscaping (70 Bow Street).

RECOMMENDATIONS

- Replace existing high timber fence to improve visibility through underpass.
- Promote awareness and protection of the No-Name Brook.
- Create an opportunity to sit and enjoy this small stream under the shade of the overpass.
- The brook was treated as a ditch in the original path construction. Work with Conservation Commission to restore the brook to the extent feasible, including elimination of the Japanese Knotweed that has taken over the course of the brook for approximately 1,500 feet, and reconstruct the stream-bed with a rock-gravel substrate.

WAYSIDE COMPONENT OPPORTUNITIES

- Interpretive kiosk wayfinding
- Views
- Public art
- Cultural, historical, or educational exhibits
- Natural areas

NEXT STEPS

Internal discussions with Mill Brook Team and Conservation Staff. Modifications to lease.Survey and design.

Figure 67. Existing images of Lowell Street Underpass



Figure 68. Existing/Proposed Sections at Underpass

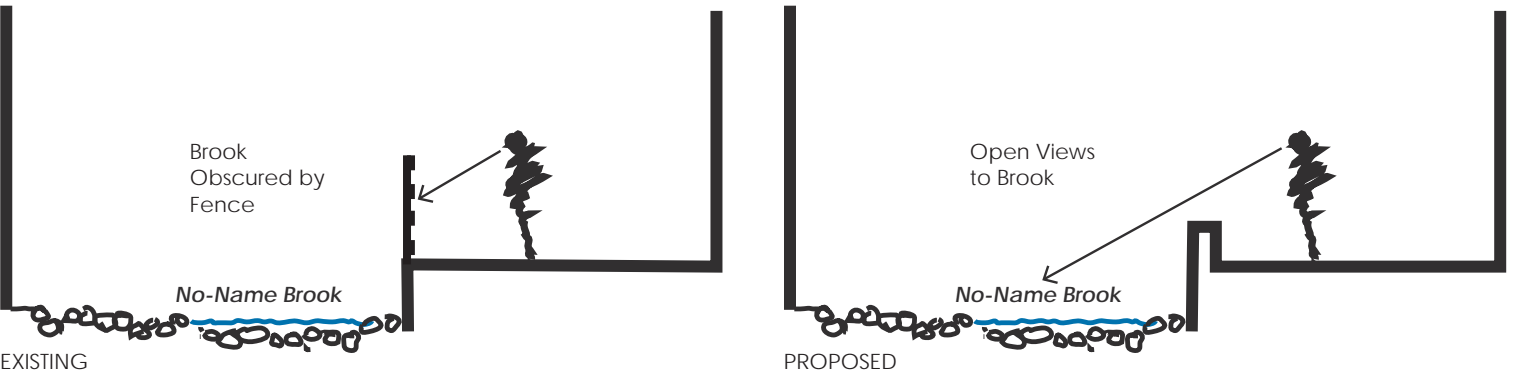


Figure 69. Schematic Plan of Improvements - Mill Lane



Frazier Road / Mill Lane

Frazier Road and Mill Lane join at a bend in the road. There is a rudimentary path connection at this location out to Frazier Street. However, located just down the connecting Mill Lane one finds the Mill Brook and the Schwamb Mill - one of the oldest continuously operating mills within the country. A bit further down Mill Lane at the intersection of Lowell Street and Massachusetts Avenue, one finds the Foot-of-the-Rocks, an important memorial location where heavy fighting took place during the Revolutionary War.

Although not immediately visible, there are ample opportunities to bring history alive along the bikeway. This is an exceptional location where there exists not one but two important places.

RECOMMENDATIONS

- Construct a wayside at the edge of the Bikeway, situated in a manner to look down Mill Lane.
- Provide interpretive panels at the wayside highlighting the history of the mill and the circumstances and actions that occurred at the Foot-of-the-Rocks location.
- Integrate accessible connections from the Bikeway down and around the overlook to the street.
- Encourage exploration and provide information for mill events and exhibits.
- Reinforce the cross connection between Bow Street and Massachusetts Avenue.
- Mill Lane is a quiet street, but Lowell Street sees heavier use. Incorporate appropriate bike and pedestrian accommodations at the crossing.

WAYSIDE COMPONENT OPPORTUNITIES

- Secondary pylon and interpretive kiosk wayfinding
- Seating
- Pull-off area
- Trash receptacles
- Bike parking
- Public art
- Cultural, historical, or educational exhibits

NEXT STEPS

Survey, conceptual design and public outreach.

Figure 70. Old Schwamb Mill



https://lh3.googleusercontent.com/vGwPqKeNA1NI2s_piRi7YpZzviCTgdN_OaMe8SAelUA4k-jA-m2av_rChAmttXcXTbh7fg=s118

Figure 71. Foot of the Rocks Postcard



<https://www.hmdb.org/Photos/343/Photo343201.jpg>

Ryder Street / Summer Street Field / Burns Arena

Ryder Street is an important cross connection between Summer Street and Massachusetts Avenue and - although closed to vehicles - the road provides both bike and pedestrian access to the Minuteman Bikeway. Given its location between Summer Street Field and the Ed Burns Arena, this location serves as both a trailhead and a major destination for recreation.

Given its ample parking, open space, restrooms & snack bar (rink), playgrounds, and courts, this trailhead is a major destination for residents. Improvements that better express the relationship and synergy between the Bikeway and the facilities would be a win-win. Removing the fence would visually link the Bikeway and this major open space.

RECOMMENDATIONS

- Incorporate missing pedestrian and bike connections between Summer Street and the Minuteman Bikeway.
- Develop a pedestrian plaza area alongside the Burns Arena.
- Create a splitter island and crossing for bikeway access from Ryder Street.
- Provide wayside pull-offs along the Minuteman Bikeway to support access and viewing of the playground, baseball field, and basketball court.
- Consider removing the fence between the Bikeway and the Summer Street Field for improved connectivity.
- Maintain ability for Public Works vehicles to enter and exit the Bikeway for maintenance

TRAILHEAD COMPONENT OPPORTUNITIES

- Landmark pylon, locational kiosk, and interpretive kiosk wayfinding
- Seating
- Views
- Landscaping and plantings
- Pull-off area
- Trash receptacles
- Bike parking and repair station
- Bike share station
- Amenities to support existing multi-use fields

NEXT STEPS

Survey, conceptual design and public outreach.

Figure 72. Schematic Plan of Improvements - Ryder Street / Summer Street Field / Ed Burns Arena



Mill Street

Mill Street is an urban minor arterial and connects two urban arterials, Massachusetts Avenue and Summer Street (MA-2A). The Bikeway is stop controlled with stop signs and bars. A rectangular rapid flashing beacon (RRFB) is automatically activated by approaching path users; when flashing, this beacon indicates that drivers should yield to path users in the crosswalk. The automatic activation of the RRFB contributes to a situation where vehicles typically yield to approaching path users who treat the intersection as uncontrolled.

Sight lines between motorists and path users are obstructed by nearby buildings, foliage, and a fence. The parallel alignment of Russell Place and the Bikeway results in challenging sight lines between motorists and path users approaching from the east. Currently, no tactile cues are provided for people with visual impairments traveling along the Bikeway or the northern Mill Street sidewalk to indicate the presence of a crossing and conflicting traffic. These are both safety issues for vulnerable path users crossing Mill Street.

RECOMMENDATIONS

Table 16. Mill Street Crossing Recommendations

Existing Issue	Recommendations
Inconsistent stopping and yielding behavior	<ul style="list-style-type: none">• Install raised intersection<ul style="list-style-type: none">◦ Improve visibility of path users◦ Slows driver speeds and encourage yield compliance◦ Creates more comfortable, level crossing for cyclists• Explore whether right-of-way priority can be assigned to the Bikeway to better reflect the current functioning of the crossing (see inset on page 85)
Sight line obstructions	<ul style="list-style-type: none">• Install curb extension on the east side of Mill Street<ul style="list-style-type: none">◦ Improves sight lines by moving path users closer to center of roadway before crossing◦ Shortens crossing and thus path user exposure to traffic◦ Implements and incorporates current concept design for the Mystic River connection along Summer Street• Increase range of approaching path user detection for existing RRFBs to give more advanced warning to motorists on Mill Street• Convert Russell Place approach to a one-way, eastbound entrance at Mill Street<ul style="list-style-type: none">◦ Prevents left hook crashes◦ Nullifies sightline issues created by parallel approaches
Lack of tactile queues for people with visual impairments	<ul style="list-style-type: none">• Install detectable warning panels on sidewalk along the west and east side of Mill Street at bikeway crossings

To achieve appropriate grades ramping up to the raised intersection, minimal tie-in work would be required at the entrance to Russell Place, which is a private way. All other recommendations may be completed without the installation of the raised intersection. To accommodate MBTA buses, the raised crossing should have a table height of no more than 3 inches and a ramp length of 9 feet (1:24)²¹.

TRAILHEAD COMPONENT OPPORTUNITIES

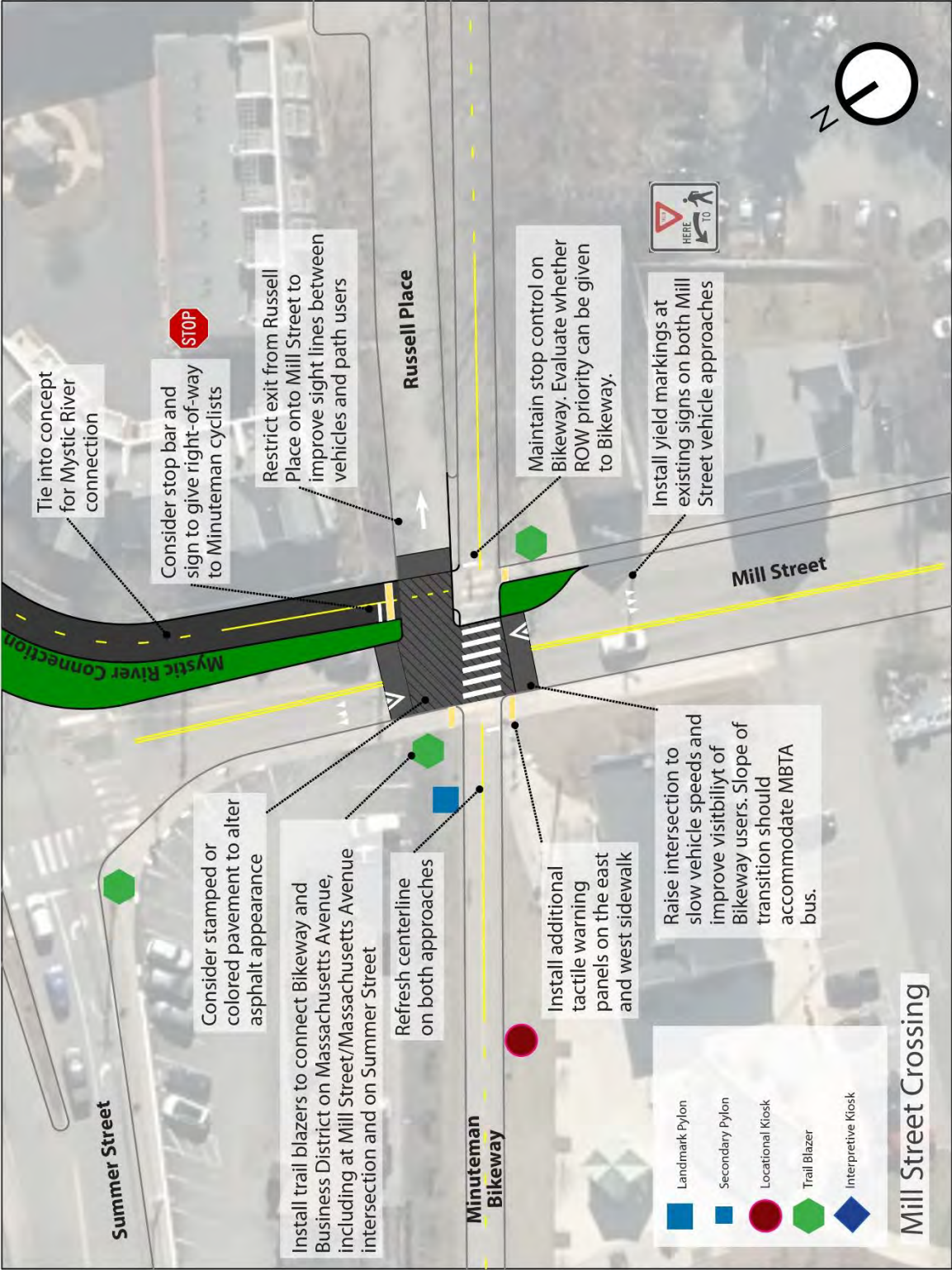
- Landmark pylon and locational kiosk wayfinding
- Seating
- Trash receptacles
- Bike parking and repair station
- Public art

NEXT STEPS

- Collect current vehicle speed and vehicle and path user count data at crossing to assess stopping sight distance triangles
- Investigate right-of-way implications for raised intersection tie-in
- Survey, conceptual design, public engagement

²¹ https://eng2.lacity.org/techdocs/streetsd/Supplemental_Design_Guide-040220-FINAL.pdf

Figure 73. Conceptual Sketch of Street Crossing Improvements – Mill Street



Assigning Right-of-Way Priority

As a high-volume, regional connector, the Minuteman Bikeway plays a crucial role in the transportation network. **The at-grade crossings of Mill Street, Water Street, and Linwood Street all merit further evaluation to determine if assigning right-of-way priority to the Bikeway is appropriate.** The overuse of stop control on shared use paths can lead to non-compliance and on the Bikeway, path users are often observed treating these crossings as uncontrolled. When a path has greater volumes and regional importance than the roadway, it may be appropriate to assign right-of-way priority to path users. This decision should be based on the following:

- Determine whether the Bikeway or the road has higher volumes based on peak hour and daily volumes (including weekends). Generally, the higher volume corridor should receive right-of-way priority.
- Determine if stopping sight distance (SSD) can be achieved. Each of the locations discussed here currently has limited sight distance. A variety of strategies can be used to achieve appropriate SSD for all approaches, including:
 - Clearing vegetation
 - Reduce SSD triangles by narrowing crossings through curb extensions
 - Install actuated LED warning signs on both Bikeway approaches to indicate when a vehicle is approaching
 - Install traffic mirrors to improve visibility around obstructions

“While in many cases roadways will have greater volumes, user volumes on popular paths sometimes exceed traffic volumes on minor crossed streets. In such situations, total user delay may be minimized if roadway traffic yields to path traffic, and given bicyclists' reluctance to lose momentum, such an operating pattern often develops spontaneously. In such situations, “YIELD” or “STOP” control is more appropriately applied on the roadway approaches...”

AASHTO Guide for the Development of Bicycle Facilities

Figure 74. Schematic Plan of Improvements - Buzzzell Field / Mill Brook Crossing



Figure 75. Cooke's Hollow / Mill Brook



https://cdn.businessyab.com/assets/uploads/8e95178305bff4e3fcc61e8733ac332a__united_states_middlesex_county_arlington_mystic_street_94_cooke_s_hollow.html

Figure 76. Cooke's Mill Lane Marker



<https://www.hmdb.org/Photos5/585/Photo585403.jpg>

Buzzzell Field / Mill Brook Crossing

Buzzzell Field is a 3.6 acre park located on the site of a former mill pond and includes two lighted youth baseball/softball fields, a basketball court, picnic tables, and a playground.

The Minuteman Bikeway crosses over the Mill Brook for a second time adjacent to Buzzzell Field where the brook enters into a deep culvert. Almost hidden within the trees at this location is a an existing set of stairs on the southern side of the Bikeway that leads down to a path along the brook and over to Mill Street. Similarly, a footpath along the perimeter of Buzzzell Field leads over to Water Street, where one can circumnavigate the Arlington Catholic Practice Field and find Cooke's Hollow and where the Mill Brook reemerges.

This location offers a primary access point to the most advanced section of the brook path and allows bikeway users to depart the path and explore the brook in two directions as follows:

- Mill Brook South (Upstream) - there is a loose collection of pathways and sidewalks that starts at Buzzzell Field, crosses Mill Street and than leads over to the high school where it will potentially connect back to the Minuteman Bikeway via a proposed access ramp. This side excursion offers approximately 1,000 feet of open brook and the total loop path would be approximately 0.3 -miles in length.
- Mill Brook North (Downstream) - Connections to Buzzzell Field provide access to recreational open space and somewhat indirectly to Cookes Hollow where the Mill Brook daylights at a waterfall.

RECOMMENDATIONS

- Construct a secure observation deck along the southern side of the Bikeway overlooking the Mill Brook.
- Reconstruct the existing staircase and connect the deck to reinforce visibility and access to the brook.
- Install a pedestrian crosswalk to link the southerly stairs to an extension of the path within Buzzzell Field.
- Install appropriate wayfinding signage to promote "Chasing the Mill Brook" as an alternate option to the Minuteman.
- Incorporate an Interpretive panel highlighting the brook and the former mill ponds.
- Provide benches and bike racks at the overlook.

WAYSIDE COMPONENT OPPORTUNITIES

- Interpretive kiosk wayfinding
- Seating
- Pull-off area
- Trash receptacles
- Bike parking
- Cultural, historical, or educational exhibits
- Natural areas

NEXT STEPS

Explore environmental constraints. Assess staircase condition and need for reconstruction. Survey, conceptual design and public outreach.

Water Street

Water Street is a quiet, low-volume residential side street stretching fewer than 800 feet from Mill Brook to Massachusetts Avenue. During the morning peak hour, motorists on Mystic Street sometimes use Russell Street to bypass the intersection with Massachusetts Avenue, resulting in increased volumes and speeds on Water Street.

The Bikeway's intersection with Water Street features stop control for path users and yield control for drivers on Water Street. Sight lines between approaching drivers on Water Street and path users are obstructed by shrubs and stone walls. Currently, no tactile cues are provided at this intersection for people with visual impairments traveling along the bikeway or Water Street.

RECOMMENDATIONS

Table 17. Water Street Crossing Recommendations

Existing Issue	Recommendations
Inconsistent stopping and yielding behavior	<ul style="list-style-type: none">• Install raised intersection<ul style="list-style-type: none">◦ Reinforce path user priority◦ Slow driver speeds and encourage yield compliance◦ Create more comfortable, level crossing for cyclists• Explore whether right-of-way priority can be assigned to the Bikeway to better reflect the current functioning of the crossing (see inset on page 85)
Sight line obstructions	<ul style="list-style-type: none">• Install curb extensions<ul style="list-style-type: none">◦ Improve sight lines by moving path users closer to center of roadway before crossing◦ Shorten crossing and thus path user exposure to traffic
Lack of tactile queues for people with visual impairments	<ul style="list-style-type: none">• Install detectable warning panels on sidewalks along east and west sides of Water Street• Install detectable warning panels across bikeway at Water Street crossing

To achieve appropriate grades ramping up to the raised intersection, minimal tie-in work would be required at the entrance to Russell Terrace, which is a private way. All other recommendations may be completed without the installation of the raised intersection.

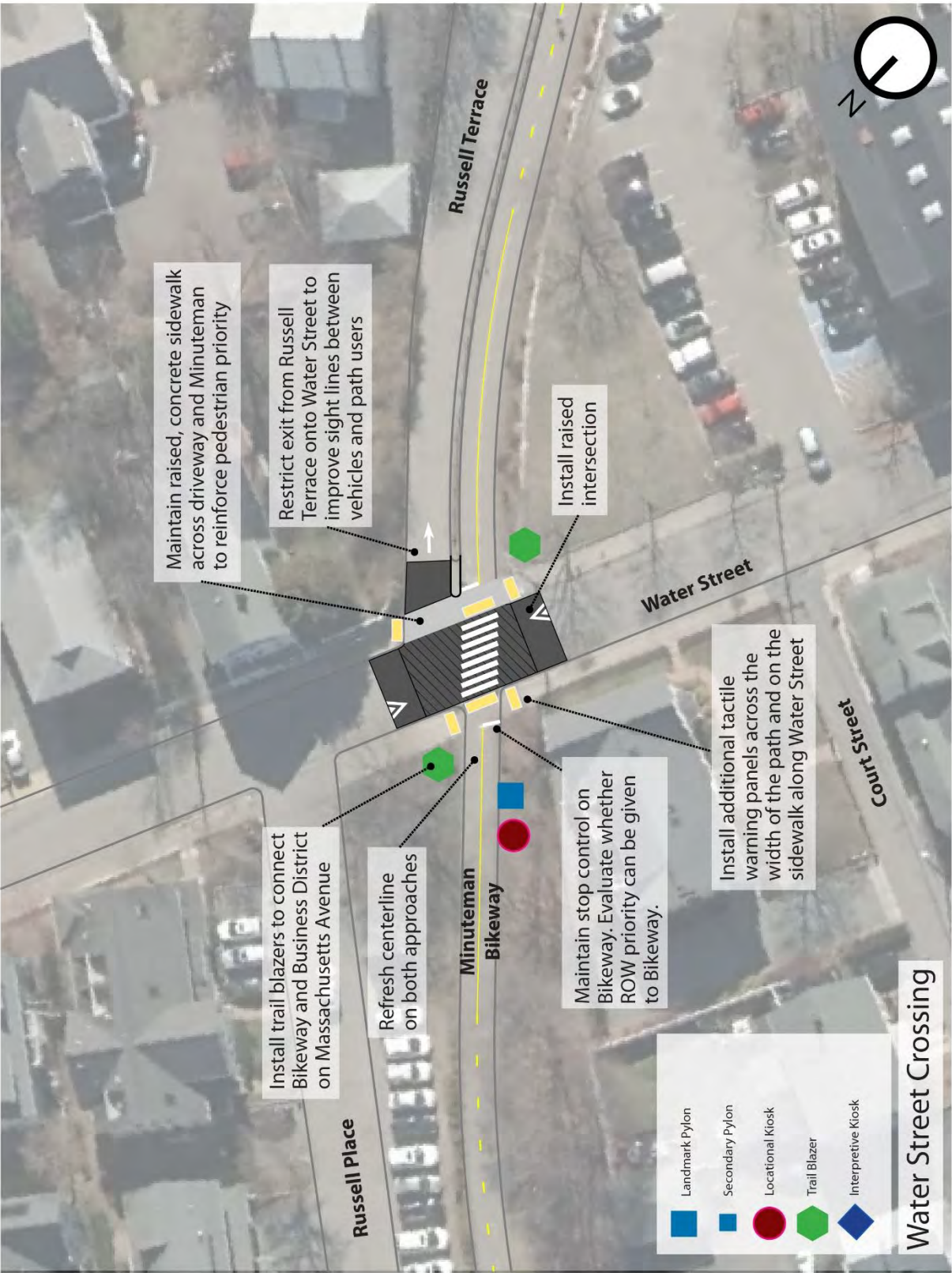
TRAILHEAD COMPONENT OPPORTUNITIES

- Landmark pylon, locational kiosk, and directional wayfinding
- Public art

NEXT STEPS

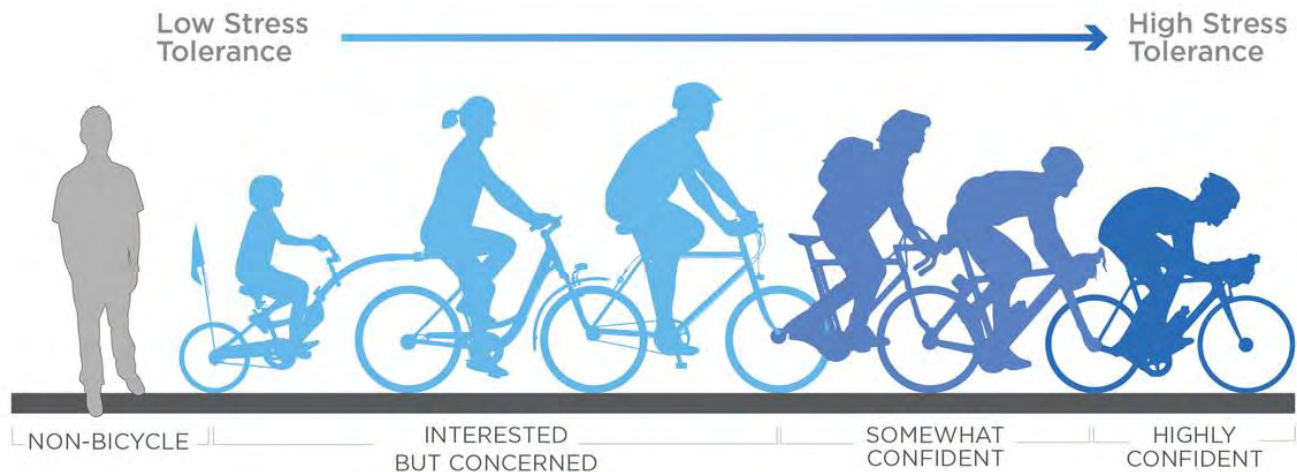
- Collect current vehicle speed and vehicle and path user count data at crossing to assess stopping sight distance triangles
- Investigate right-of-way implications for raised intersection tie-in
- Survey, conceptual design, public engagement

Figure 77. Conceptual Sketch of Street Crossing Improvements – Water Street



Massachusetts Avenue/Swan Place/Mystic Street

The only gap in the otherwise continuous off-street Bikeway is the section of the Minuteman on Massachusetts Avenue between Swan Place and Mystic Street in Arlington Center. The Bikeway is currently connected with unprotected, painted bike lanes along Massachusetts Avenue. Based on criteria such as vehicle speeds and volumes, roadway classification, and bicycle facility type, these bicycle facilities have a Level of Traffic Stress (LTS) 4 (only highly confident users will be comfortable using this segment).²² Along Swan Place, which is a lower speed and volume street, vehicle lanes are marked with shared lane markings (“sharrows”), and no formal bike facilities are provided (LTS 2; most riders will be comfortable enough to use this segment).



In addition to being a gap in the low-stress Bikeway, the on-street transition creates a bicycle capacity issue for southbound cyclists. The existing bike box for southbound cyclists regularly overflows during weekday peak travel times and throughout weekends. Additionally, a two-stage left turn requires two signal phases and thus results in further delay for cyclists.

Turning on red is prohibited for vehicles at the intersection of Massachusetts Avenue and Mystic Street, but westbound drivers on Massachusetts Avenue routinely turn right on red. This is a safety issue for pedestrians and cyclists crossing Mystic Street who are at risk of a “right hook” collision. Bike signals are the same size as the vehicle signals at this intersection, which may confuse drivers in the right-most lane who see a green right-most signal.

Wayfinding for path users is unclear and absent through this connection. For pedestrians, there is no discrete wayfinding to navigate the gap along the path. A small “BIKE ROUTE” sign is located at the far side of Massachusetts Avenue for bicyclists approaching from Swan Place. It is unclear whether this sign refers to Massachusetts Avenue as a bike route west of Mystic Street or to the Bikeway and thus is not sufficient wayfinding for northbound cyclists looking to continue along the Minuteman Bikeway.

For southbound cyclists, a “BIKE ROUTE” sign is posted across Massachusetts Avenue from the northern corner of the intersection with Mystic Street. It is difficult to notice and confusing for bicyclists who are not aware of the bike box in front of eastbound traffic on Massachusetts Avenue. The orientation of the “[BIKE] MAY USE FULL LANE” sign on a signal pole at the northern corner of Massachusetts Avenue and Mystic Street leads to confusion and may contribute to people riding

southbound in the northbound bike lane. Since the intersection was reconstructed relatively recently, the following approaches can be applied to address the issues with safety, comfort, wayfinding, and delay present along this gap in the Bikeway without full-depth construction and using quick build materials.

SHORT-TERM RECOMMENDATIONS

Table 18. Massachusetts Avenue Crossing Short-term Recommendations

Existing Issue	Recommendations
Bicyclist level of traffic stress along Massachusetts Avenue and Swan Place	<ul style="list-style-type: none">• Install two-way, separated bicycle facility (LTS 1) on the westbound side of Massachusetts Avenue and northbound side of Swan Place. The cross-section of Massachusetts Avenue westbound is approximately 50 feet wide. Assuming 11-foot travel lanes, the cross-section can accommodate a 12-foot-wide bidirectional bike facility with a 5-foot buffer. Supplement flex posts with planters for additional vertical and visual buffer between eastbound cyclists and the bus lane.• Implement combined right-turn/bus-only lane to mitigate impacts to transit operations due to removal of vehicle lane• Convert Swan Place to one-way southbound up to Swan Street to create space for continuation of bi-directional bicycle facility. Vehicles use Swan Street and Pleasant Street to egress.
Westbound drivers' noncompliance with “NO TURN ON RED”	<ul style="list-style-type: none">• Replace vehicle-sized bike signal heads with human-scale bike signal heads<ul style="list-style-type: none">◦ Do not draw drivers' attention◦ Create welcoming, human-scale environment for people walking, wheeling, and biking◦ Consider countdown signal for bicyclists
Northbound cyclists' noncompliance with red signal on Swan Place approach	<ul style="list-style-type: none">• Install near-side, human-scaled bike signals for both bicycle approaches<ul style="list-style-type: none">◦ Consider countdown signals to indicate bicycle detection and encourage compliance
Pedestrian Delay	<ul style="list-style-type: none">• Add concurrent pedestrian walk phase green on recall across Swan Place at Massachusetts Avenue during eastbound vehicle green
Ineffective wayfinding	<ul style="list-style-type: none">• Install branded and conspicuous wayfinding signs along the bike and pedestrian connections through the gap between Swan Place and Mystic Street• Install two-way, separated bicycle facility with green-painted crossings<ul style="list-style-type: none">◦ Reduces number of bicycle crossings necessary and streamlines connection• Remove or update and relocate existing gateway sign at former bikeway entrance along Mystic Street
Bicycle crossing across Mystic Street leads to curb reveal and signal pole	<ul style="list-style-type: none">• Shift crosswalk and bike crossing so they lead directly to the existing northeast ramp away from intersection• Consider a mixed-use crossing in the short-term if cost prohibits ramp extension

²² <https://www.boston.gov/sites/default/files/file/2020/12/BLTS%20Table.pdf>

MEDIUM- AND LONG-TERM RECOMMENDATIONS

Potential medium- and long-term improvements to this connection include:

- Medium-term construction of concrete median for full separation between bidirectional bike lanes and bus lane.
- Long-term full construction of a raised, bidirectional cycletrack along Massachusetts Avenue and Swan place
- Long-term full construction of a curb extension at the northern corner of Massachusetts Avenue and Mystic Street to provide more space for people waiting to cross Mystic Street
- Tie-in Bikeway crossing treatments at Massachusetts Avenue/Swan Place/Mystic Street to future bicycle facility upgrades on Massachusetts Avenue in line with Connect Arlington.

TRAILHEAD COMPONENT OPPORTUNITIES

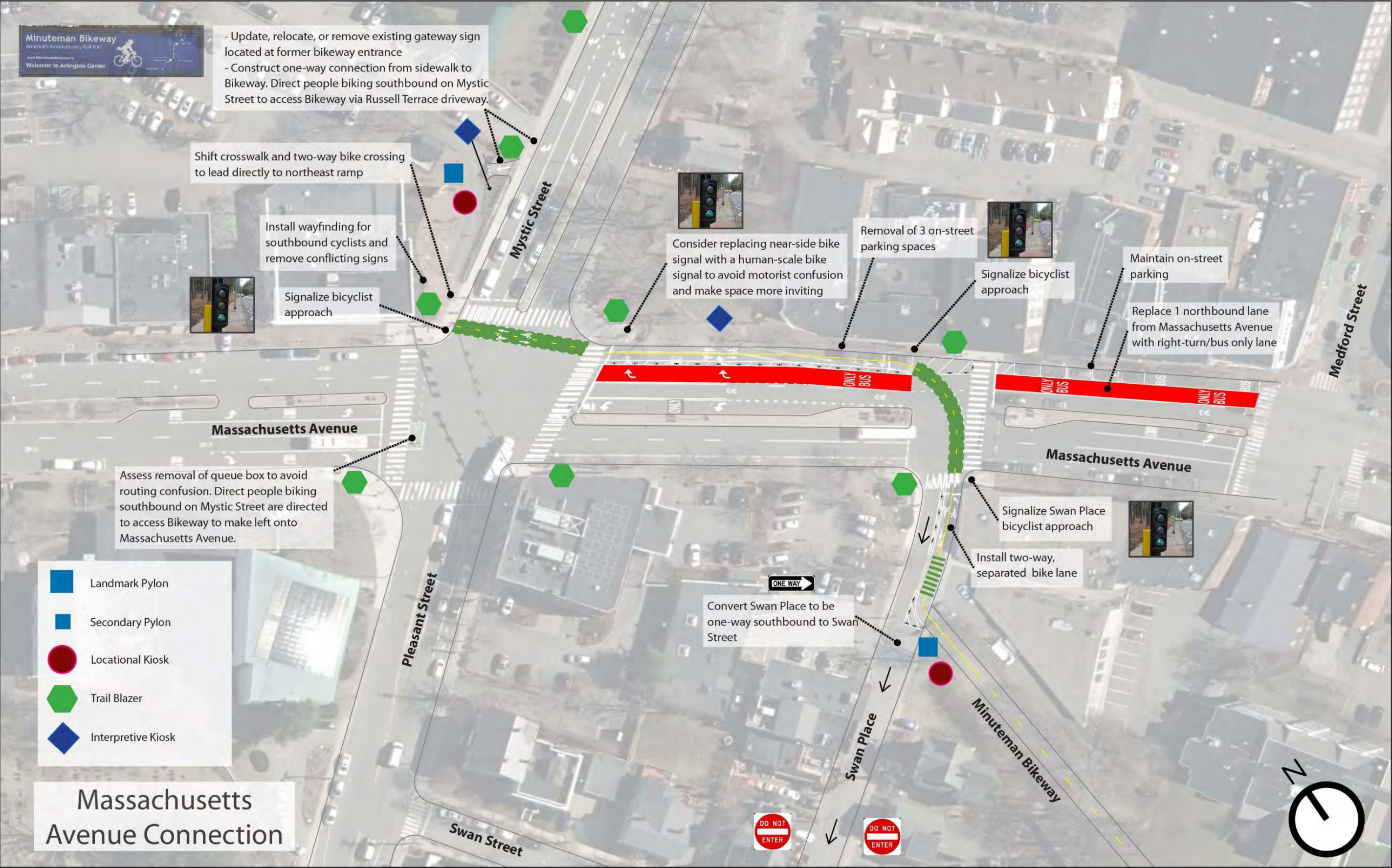
- Landmark pylons, locational kiosks, interpretive kiosks, and directional wayfinding
- Other trailhead components such as bike parking, bike share, seating, and cultural waysides already exist as part of Arlington Town Center and recent work at Whittemore Park

NEXT STEPS

- Conduct operations analysis related to converting Swan Place to one-way in and lane configuration on Massachusetts Avenue
- Survey, conceptual design, public engagement

THIS PAGE LEFT INTENTIONALLY BLANK

Figure 78. Conceptual Sketch of Street Crossing Improvements – Massachusetts Avenue / Swan Place / Mystic Street



Spy Pond Field / Whittemore Street

Spy Pond Field is located south of the Minuteman Bikeway and considerably below the elevation of the trail. An existing access path is far too steep for use and does not meet current accessibility standards.

Spy Pond is a large recreational area and an accessible connection from the downtown area is notably missing. An enhanced entrance at this location would provide access to Spy Pond Field, the Arlington Boys & Girls Club, and the northerly end of Spy Pond Park.

SHORT-TERM RECOMMENDATIONS

- Address erosion
- Use pavement markings to alert Bikeway users to the access point and emphasize right-of-way priority
- Use wayfinding to direct path users from the Bikeway to Spy Pond Field and Whittemore Street (with access to Massachusetts Avenue) and vice versa.

LONG-TERM RECOMMENDATIONS

- Reconstruct the access ramp down from the Bikeway to the field, taking care to disturb the steep hill or vegetation as little as possible.
- Consider reconstructing the existing path that connects down to Lombard Terrace to provide the accessible connection.
- Modify the Whittemore Street underpass to eliminate the steps.
- Construct a loop path around Spy Pond Field for a complete pedestrian/bike network.

TRAILHEAD COMPONENT OPPORTUNITIES

- Directional wayfinding
- Public art
- Amenities to support existing multi-use fields

NEXT STEPS

- Implement short-term recommendations
- Conduct survey, conceptual design, and public outreach.

Figure 79. Sketch of Short-Term Improvements - Spy Pond Field / Whittemore Street

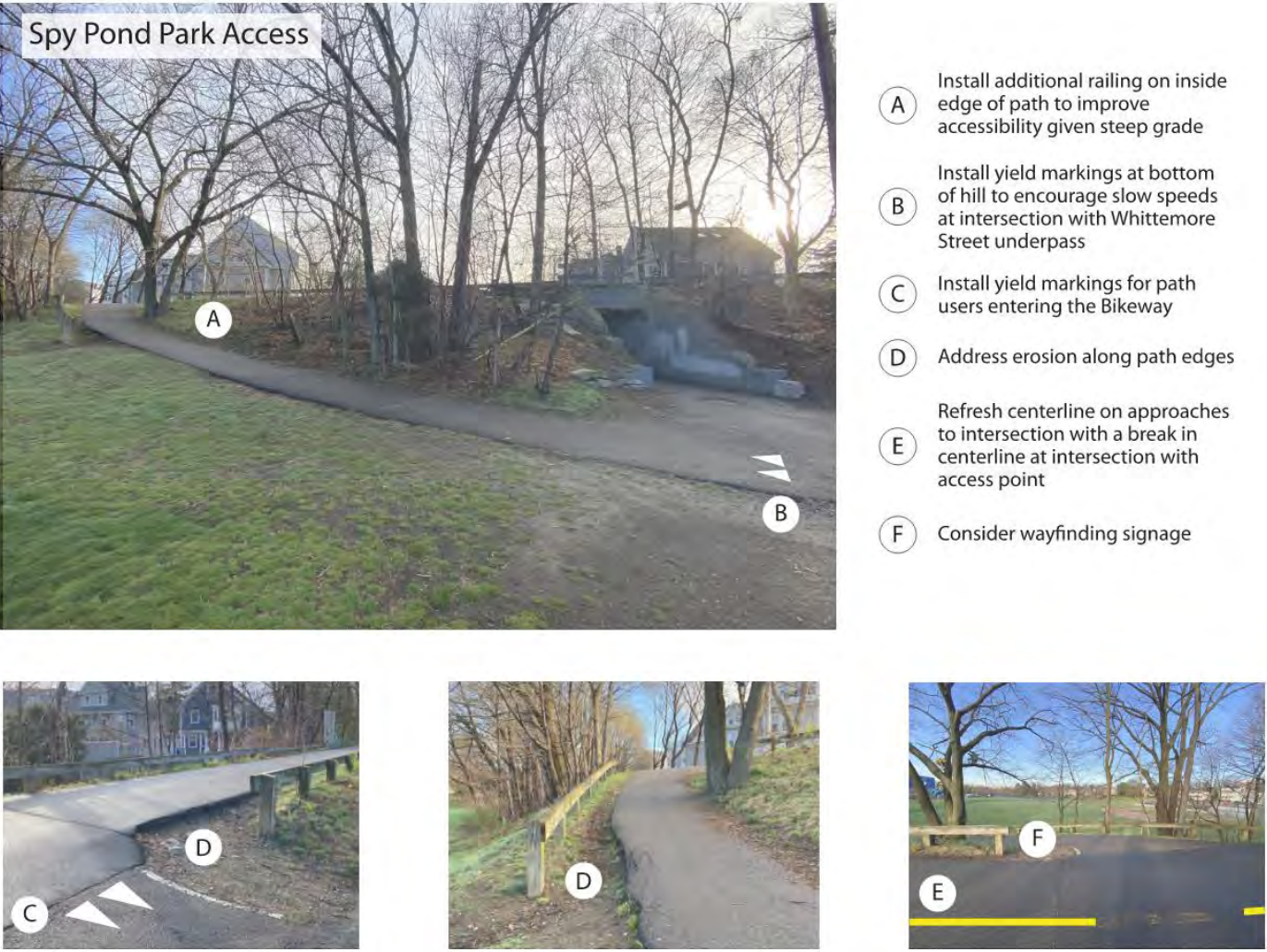


Figure 80. Schematic Sketch of Long-Term Improvements - Spy Pond Field / Whittemore Street



21 Pond Lane

This 1.5 acre parcel of town-owned land is located adjacent to the Minuteman Bikeway with frontage on Pond Lane. The current parcel is mostly wooded with a small clearing in the center.

A new configuration would provide a local park and improved access to the Bikeway from Pond Lane neighborhood.

RECOMMENDATIONS

- Construct a small pocket park here using the existing clearing as the center of the park. Retain large trees around perimeter for shade and as a buffer to adjacent residences.
- Construct an accessible path connection around the side of the open space from the Bikeway down to Pond Lane.
- Complete the pedestrian network by tying the existing sidewalk network into the new connector path, being careful not to encourage high speed bike traffic into the park.
- Provide appropriate signage.

WAYSIDE COMPONENT OPPORTUNITIES

- Secondary pylon and directional wayfinding
- Seating
- Landscaping and plantings
- Trash receptacles
- Public art
- Natural areas

NEXT STEPS

Survey, conceptual design, and public outreach.

Figure 81. Schematic Plan of Improvements - 21 Pond Lane



Spy Pond Overlook

The Minuteman Bikeway passes along 0.3-miles of shoreline to Spy Pond Park. Although the Bikeway gets as close as 100-feet to the water’s edge, there are very few views of the pond without having to leave the Bikeway due to the dense vegetation. The Bikeway is grade-separated from the street network and Spy Pond Park; a view area for Spy Pond will provide a pull-off area for path users out of the way of traffic and increase visibility and awareness of the existing staircase down to the Spy Pond Park.

RECOMMENDATIONS

- Construct an overlook structure alongside the Bikeway for stopping and viewing adjacent to the existing staircase.
- Clear a view corridor to the pond. Coordinate the location to minimize impacts to the park setting.
- Provide interpretive panels highlighting the geologic nature and past uses of the pond (including ice harvesting).
- Provide bike parking so path users do not need to carry their bikes down stairs to access Spy Pond Park.

WAYSIDE COMPONENT OPPORTUNITIES

- Interpretive kiosk wayfinding
- Seating
- Views and vistas
- Pull-off area
- Bike parking
- Natural areas
- Provide amenities that support existing playground and secondary path uses

NEXT STEPS

Survey, conceptual design and public outreach.

Figure 82. Conceptual Sketch - Spy Pond Overlook



Figure 83. Schematic Plan of Improvements - Spy Pond Overlook



Linwood Street

Linwood Street is a quiet, low-volume residential side street terminating at Spy Pond in a small, one-way traffic circle approximately 100 feet from the intersection with the Minuteman Bikeway and Hamilton Road.

The bikeway is stop controlled with stop signs and bars. The high volumes on the Bikeway and low volumes on Linwood contribute to a situation where vehicles typically yield to approaching path users who treat the intersection as uncontrolled.

Sight lines between drivers approaching from the east and path users on both approaches are obstructed by an elevation difference and vegetation. Currently, no tactile cues are provided for people with visual impairments traveling along the bikeway or the northern Linwood Street sidewalk to indicate the presence of a crossing and conflicting traffic. These are both safety issues for vulnerable path users crossing Linwood Street.

RECOMMENDATIONS

Table 19. Linwood Street Crossing Recommendations

Existing Issue	Recommendations
Application of stop control along high volume, regional bikeway results in low compliance	<ul style="list-style-type: none">• Install raised intersection<ul style="list-style-type: none">◦ Reinforces path user priority◦ Slows driver speeds and encourage compliance with the stop sign.◦ Creates more comfortable, level crossing for path users• Explore whether right-of-way priority can be assigned to the Bikeway to better reflect the current functioning of the crossing (see inset on page 85)
Sight line obstructions	<ul style="list-style-type: none">• Install curb extensions<ul style="list-style-type: none">◦ Improve sight lines by moving path users closer to center of roadway before crossing◦ Shorten crossing and thus path user exposure to traffic• Evaluate frequency of right turn movements from Hamilton Road onto Linwood Street and whether drivers have trouble seeing approaching northbound path users. If this appears to be an issue, consider prohibiting right turns out of Hamilton Road, directing drivers to circle around cul-de-sac and approach Bikeway head on.• Consider installing a traffic mirror or vehicle detection device that can improve path users' awareness of approaching and/or stopped vehicles on Linwood Street.
Lack of tactile queues for people with visual impairments	<ul style="list-style-type: none">• Install detectable warning panels on sidewalk along the north side of Linwood Street at Bikeway and Hamilton Road crossings• Install detectable warning panels across Bikeway and sidewalks at Linwood Street crossing

To achieve appropriate grades ramping up to the raised intersection, minimal tie-in work would be required at the entrance to Hamilton Road, which is a private way within the MBTA right-of-way. All other recommendations may be completed without the installation of the raised intersection.

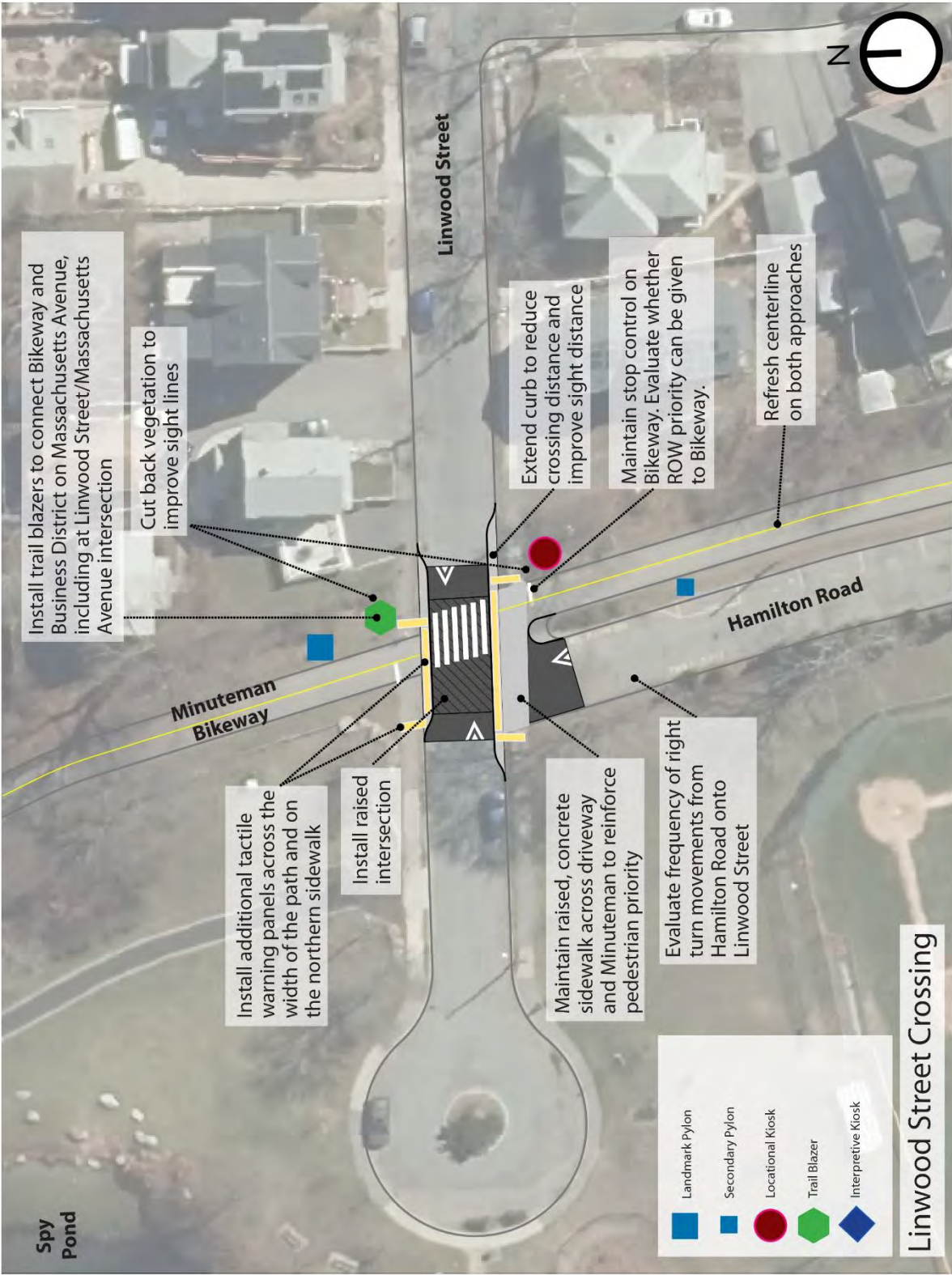
TRAILHEAD COMPONENT OPPORTUNITIES

- Landmark pylon, locational kiosk, and directional wayfinding
- Public art
- Other trailhead components such as bike parking, bike share, seating, multi-use fields, and side paths already exist as part of Scannell Field and Spy Pond Park

NEXT STEPS

- Observe frequency of right turn movements from Hamilton Road onto Linwood Street across the Bikeway
- Collect current vehicle speed data at crossing to assess stopping sight distance triangles
- Investigate right-of-way implications for raised intersection tie-in
- Survey, conceptual design, public engagement

Figure 84. Conceptual Sketch of Street Crossing Improvements – Linwood Street



THIS PAGE LEFT INTENTIONALLY BLANK

Figure 85. Sketch of Short-Term Improvements - Orvis Circle



- (A) Consider non-asphalt compact surface treatment to increase accessibility of access point while maintaining semi-private nature
- (B) Consider widening access point. In the short term maintain access.
- (C) Cut back or clear vegetation to improve sight distance
- (D) Refresh centerline



Orvis Circle

Orvis Circle is a small horse-shoe shaped private street located off Brooks Avenue and at the end of the tree-lined boulevard known as Orvis Road. This intimate space has four houses situated around a central green space, as well as a rudimentary connection to the Minuteman Bikeway. Orvis circle is an example of a private way that provides public access. Accessibility and sight line improvements will make this access point safer and more comfortable for all users and subtle wayfinding will enhance path user orientation; improvements should be balanced with communicating the transition from public to private way.

In the long-term, an enhanced entrance can be crafted in partnership with abutters to enhance the Bikeway and Circle, serve as a wayfinding checkpoint, and clarify the nature of the public realm.

Done correctly, the design for this location could be employed at other sidestreets including Nourse Street, Lowell Street Place, Brattle Court, Russell Street, etc.)

RECOMMENDATIONS

- Improve access point at Minuteman Bikeway to provide accessible connection.
- Update fence and gate to an attractive style that complements the residential nature of this location.
- Provide a street name along the Bikeway that identifies the access point.

WAYSIDE COMPONENT OPPORTUNITIES

- Directional wayfinding
- Landscaping and plantings
- Public art

NEXT STEPS

Survey and development of prototype.

Figure 86. Conceptual Options - Neighborhood Entries



Lake Street

Lake Street is an urban minor arterial connecting the Concord Turnpike (MA-2) to Massachusetts Avenue (MA-2A/US-3). The intersection with the Bikeway is currently signalized with through arrow signal heads for motorists on Lake Street and bicycle and pedestrian signal heads for people approaching on the Bikeway. As noted in Chapter 1, this intersection was reconstructed in 2020 to improve traffic delay and to provide a more orderly, predictable crossing for both Bikeway and Lake Street users.

Since the reconstruction of this intersection, many motorists have turned onto the Bikeway from Lake Street, likely due to the large, vehicle-scale infrastructure, including the signals and mast arm. In terms of accessibility, blind people cannot distinguish between the concrete and asphalt surfaces and therefore may approach Lake Street in the bike queue space rather than the adjacent concrete pedestrian areas. In addition, the detectable warning panels do not extend across the bike crossing. These issues endanger path users at this intersection.

RECOMMENDATIONS

Table 20. Lake Street Crossing Recommendations

Existing Issue	Recommendations
Motorists turning onto bikeway	<ul style="list-style-type: none">• Replace scored concrete medians on bikeway approaches<ul style="list-style-type: none">◦ Adds vertical element visible by drivers◦ Passable for emergency and maintenance access• Install stamped edge markings to highlight pedestrian and bicycle crossings• Consider stamped or colored pavement to alter asphalt appearance on bikeway approaches• Incorporate trailhead components in concrete pull-off areas on both Bikeway approaches• Install turn restriction signs on mast arm
Discontinuous detectable warning panels across path at Lake Street crossing	<ul style="list-style-type: none">• Extend existing panels for pedestrians across bikeway

TRAILHEAD COMPONENT OPPORTUNITIES

- Landmark pylon, locational kiosk, and directional wayfinding between Bikeway and Massachusetts Avenue
- Landscaping opportunity in median islands
- Stamped edging of Bikeway crossing can be branded specific to the Bikeway in Arlington
- Add informational wayfinding, benches, trash receptables, and bicycle parking in pull out areas on both approaches.
- Public art

NEXT STEPS

Survey, conceptual design, public engagement

Figure 87. Conceptual Sketch of Street Crossing Improvements – Lake Street



0 Brooks Avenue at Brooks Avenue / Varnum Street

This Town owned parcel is located on the corner of Brooks Avenue and Varnum Street. Measuring just under 5,000 square feet, this open lot is located adjacent to the bike corridor and a small rudimentary access point.

SHORT-TERM RECOMMENDATIONS

- Install crosswalk across Bikeway connecting Varnum Street and Thorndike Parking Lot.
- Refresh existing centerline.
- Improve sight distance by clearing vegetation.

LONG-TERM RECOMMENDATIONS

- Open up space and create a gateway that is both visually prominent and well marked as a public access point.
- Develop space to provide secondary function as a postage stamp park with seating and landscaping and that uses the existing mature tree as a focal point.
- Provide a splitter island configuration at bikeway connection to calm traffic as southbound path users enter Thorndike Park area, which typically has high volumes of people, dogs, and children, and minimize conflicts between thru-traffic and merging users.
- Consider realigning access path from Varnum to align with postage stamp park to create a more cohesive space with high visibility from the Bikeway.

WAYSIDE COMPONENT OPPORTUNITIES

- Landmark pylon and locational kiosk
- Seating
- Landscaping and plantings
- Trash receptacles
- Public art
- Natural areas

NEXT STEPS

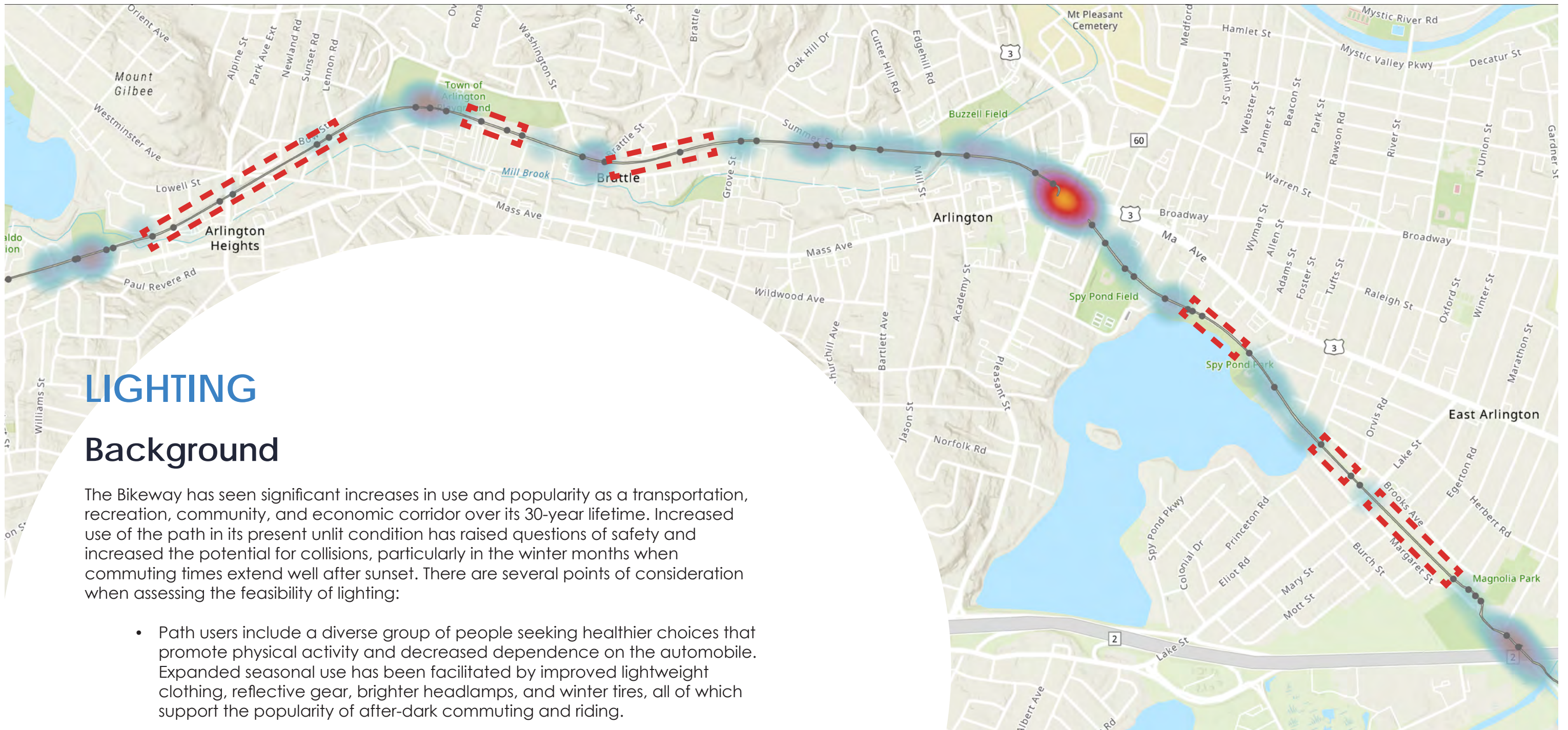
- Implement short-term recommendations
- Conduct survey, conceptual design, and public outreach.

Figure 88. Sketch of Short-Term Improvements - Brooks Avenue / Varnum Street



Figure 89. Sketch of a Possible Long-Term Vision - Brooks Avenue / Varnum Street





LIGHTING

Background






The Bikeway has seen significant increases in use and popularity as a transportation, recreation, community, and economic corridor over its 30-year lifetime. Increased use of the path in its present unlit condition has raised questions of safety and increased the potential for collisions, particularly in the winter months when commuting times extend well after sunset. There are several points of consideration when assessing the feasibility of lighting:

- Path users include a diverse group of people seeking healthier choices that promote physical activity and decreased dependence on the automobile. Expanded seasonal use has been facilitated by improved lightweight clothing, reflective gear, brighter headlamps, and winter tires, all of which support the popularity of after-dark commuting and riding.
- Lighting was considered during the path's original planning. Town staff and residents raised concerns about security, light pollution, overuse, undesirable activities, and abutter impacts, all of which stalled any further action.
- The costs and responsibilities related to installation and maintenance of a public lighting system would most likely rest with the Town.
- The Conservation Commission has raised concerns about the effect of lighting on natural habitats along the path.
- The need to excavate and install the foundations and conduits for a new lighting system has raised concerns about exposing contaminated soils and the arduous regulatory requirements that the MBTA would likely require.



Figure 90. Assessment of Existing Lighting Locations

Table 21. Existing Lighting Along the Minuteman Bikeway

	1. Lit Sections of Path	2. Unlit Sections of Path
A.		
B.		
C.		<p>The fixture located near Mystic Street (1B) is a historic style fixture that lacks any type of directional or physical light control (i.e., you see the light source) which leads to excessive glare or a blinding effect. This fixture would be considered non-compliant with today's lighting standards.</p> <p>In the absence of path lighting, bike lamps are typically used for illumination (2A, 2B). The narrow depth of the illumination demonstrates the potential safety issues.</p>

Existing Lighting Overview

Existing lighting conditions are illustrated in **Table 21**. There is no dedicated path lighting along the 3-mile corridor, but rather light spillage from adjacent streetlights, private property, public parks, and occasional parking lots. This includes the following:

- Light Spillage - Unintentional light throw from an adjacent source or sources. This can be observed at the Thorndike Field Dog Park (1A), between Mystic Street and Water Street (1B), and at each of the sports fields adjacent to the pathway.
- Spot lighting - Standalone lights intentionally placed to target a location for safety or security. These are generally observed at street crossings (1C).

As such, there are large sections of the Bikeway characterized by patchy light, occasional areas of intense lighting, and in many cases, complete darkness (2A, 2B).



(A) Lake Street:
Pendent luminaire
with Bishop's Crook
style pole

Figure 91. Proposed Lighting at Lake Street

(B) Study: LED luminaire
mounted atop
a straight pole



Proposed Improvements

Recent improvements to the Lake Street intersection proposed using a Pendent luminaire with a Bishop's Crook pole, as shown in **Figure 91(A)**. Although this lighting has not yet been installed, a selection here could set a precedent for the rest of the corridor.

For the purposes of this study, a simple pole mounted LED luminaire has been used, as shown in **Figure 91(B)**.

Proposed Lighting Design

Lighting Objectives

Illumination is the primary objective to improve visibility for:

- Safety of path users along the path and at street crossings and connections
- Security and visibility of neighbors that use the path at night
- Comfort of path users so that they are not walking or riding in the pitch dark or being blinded by glare
- Extended hours for recreational users to allow post-rush hour family and neighborhood time on the path

Design Standards for Illumination

- Establish consistent moderate light levels along the length of the Bikeway. This can be achieved with relatively equal spacing and equal height fixtures of comparable illumination, and an appropriate photometric distribution pattern.
- Provide lighting that meets the standard performance guidelines and best practices, including:
 - Town of Arlington zoning ordinances section 14.²³
 - A fixture’s energy conservation, maintenance, and durability.
 - Cut-off luminaires to protect adjacent property owners from errant light pollution.
 - Illuminating Engineering Society of North America (IESNA) standards to provide lighting at a level for safety and comfort. See **Figure 92**.
 - Dark sky considerations for horizontal and upward light pollution mitigation.
- LED luminaires will offer several benefits including greater energy conservation and longevity. Commercially available lighting can be maintained for as long as 25 years. LED fixtures also have superior photometric controls without physical shields because the pattern of LED units is what determines the lighting distribution and cut off characteristics.
- Intersections and street crossing lighting should be provided as a high priority for all street crossings. These could be in the form of targeted advanced illumination to serve crosswalk locations on-grade, where the path crosses a municipal street. This would achieve illumination so drivers approaching a crosswalk could see path users clearly from a distance appropriate to the sight distance associated with the posted speed limit of the street (assumed per NACTO design standards to be 25 miles an hour). The stopping sight distance for illumination would be approximately 115 feet. Path junctions with side streets and other neighborhood connections should have illumination so that people can read trail signs for direction and have adequate visibility for approaching path users from different directions coming to a trail junction.

- Locations along the Bikeway at side connections along the path should have adequate lighting so that people can safely dismount their bicycles and connect to those adjacent uses safely and comfortably.
- Supplemental lighting for creative purposes and ambiance for specific trailheads or other areas of amenity could also be considered, but would be supplemental to the primary job of illumination.
- A coherent family of lighting and site furniture could be developed for ease of maintenance through Arlington. This consistency does not exist along much of the Bikeway over the multiple towns that the path traverses. While individual creativity on a town-by-town basis has value, a greater sense of the path as a unified whole would benefit from consistent materials.

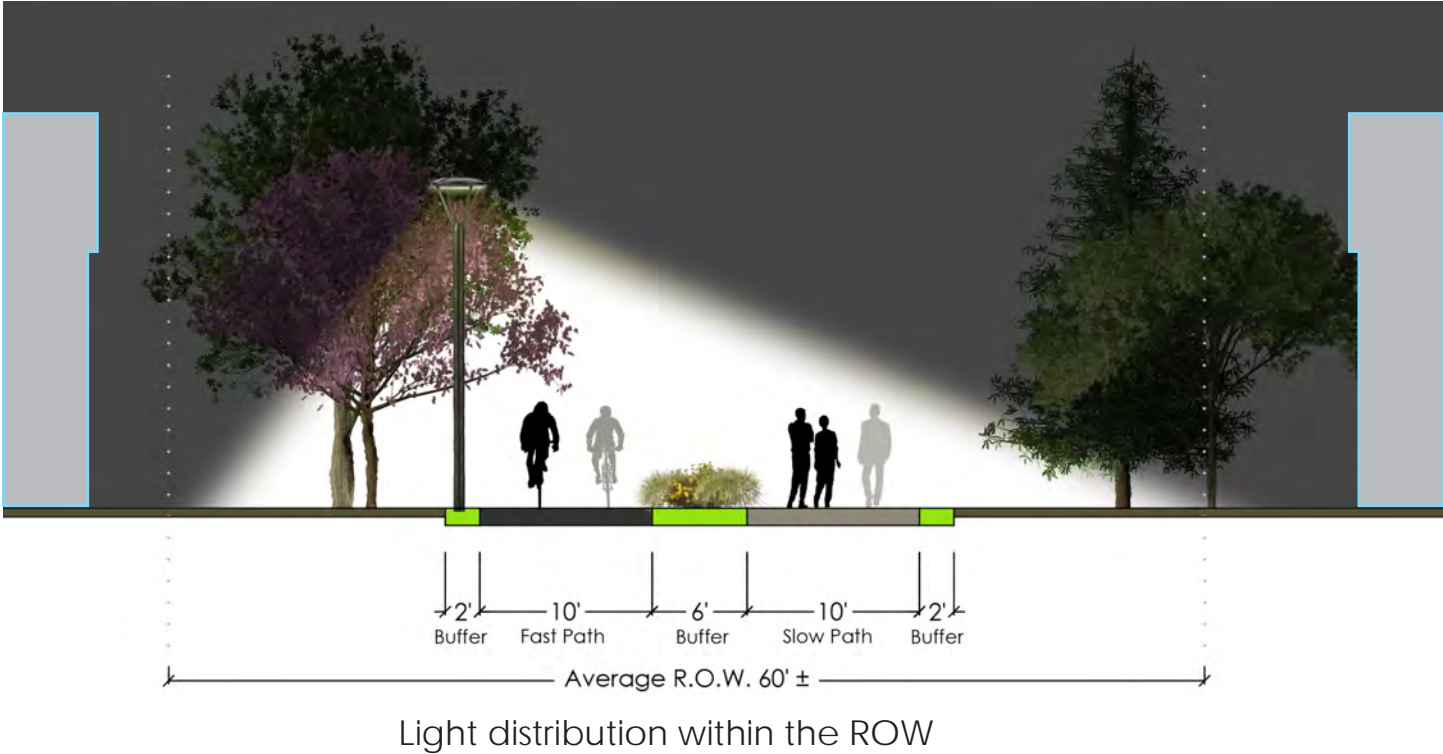
Figure 92. Five Principles for Responsible Outdoor Lighting



Image Source: <https://www.darksky.org/our-work/lighting/lighting-principles/>

23 <https://www.arlingtonma.gov/town-governance/laws-and-regulations/town-bylaws/title-v-regulations-upon-the-use-of-private-property>

Figure 93. Typical Cross Section with Lighting



Proposed Pole Height

The proposed photometrics are based upon the use of a 20-foot height pole. While pole height is highly variable, a 20-foot height pole provides efficient and appropriate light distribution and avoids unintended consequences such as the following:

- Poles less than 12-feet in height or more prone to vandalism.
- Shorter poles place the light source down within the users cone of vision and may lead to light blindness.
- The brightness of LED units creates greater glare the closer they are to the ground. A taller pole allows the light to diffuse and provide uniform coverage.
- Pole height is often confused with glare and darkness and the contrast of those is often what causes abutter light distress.
- Poles taller than 20' are more likely to be blocked by vegetation.

A 20-foot pole is similar to a street light mounting height, which is higher than the decorative pole lights found along Massachusetts Avenue and within the Thorndike Field Dog Park.

Proposed Luminaire Selection

Luminaires are the complete light unit including the illuminant (actual light source), mounting, housing, reflector, shield, and cover. In most cases, luminaires should be selected based on their performance more than their aesthetics.

Per Arlington lighting standards, "all outdoor lighting...shall be appropriately continuous, indirect, and installed and/or shielded in a manner that shall prevent unreasonably bright light from shining onto or upon any street and/or nearby property whether directly or by creating unreasonably bright glare." Furthermore, no lighting shall distribute above "a 90 degree horizontal plane."²⁴

Figure 93 and **Figure 94** illustrate this approach where the luminaire is shown with a horizontal angle of cut-off at 60 degrees to make sure there is no errant light pollution to abutting properties across from the light fixture location. As can be seen from the photometric patterns of light distribution on the plan views at the end of this section, the 60-degree projection carries approximately 40-feet out across the pathway.

²⁴ <https://www.arlingtonma.gov/town-governance/laws-and-regulations/town-bylaws/title-v-regulations-upon-the-use-of-private-property>

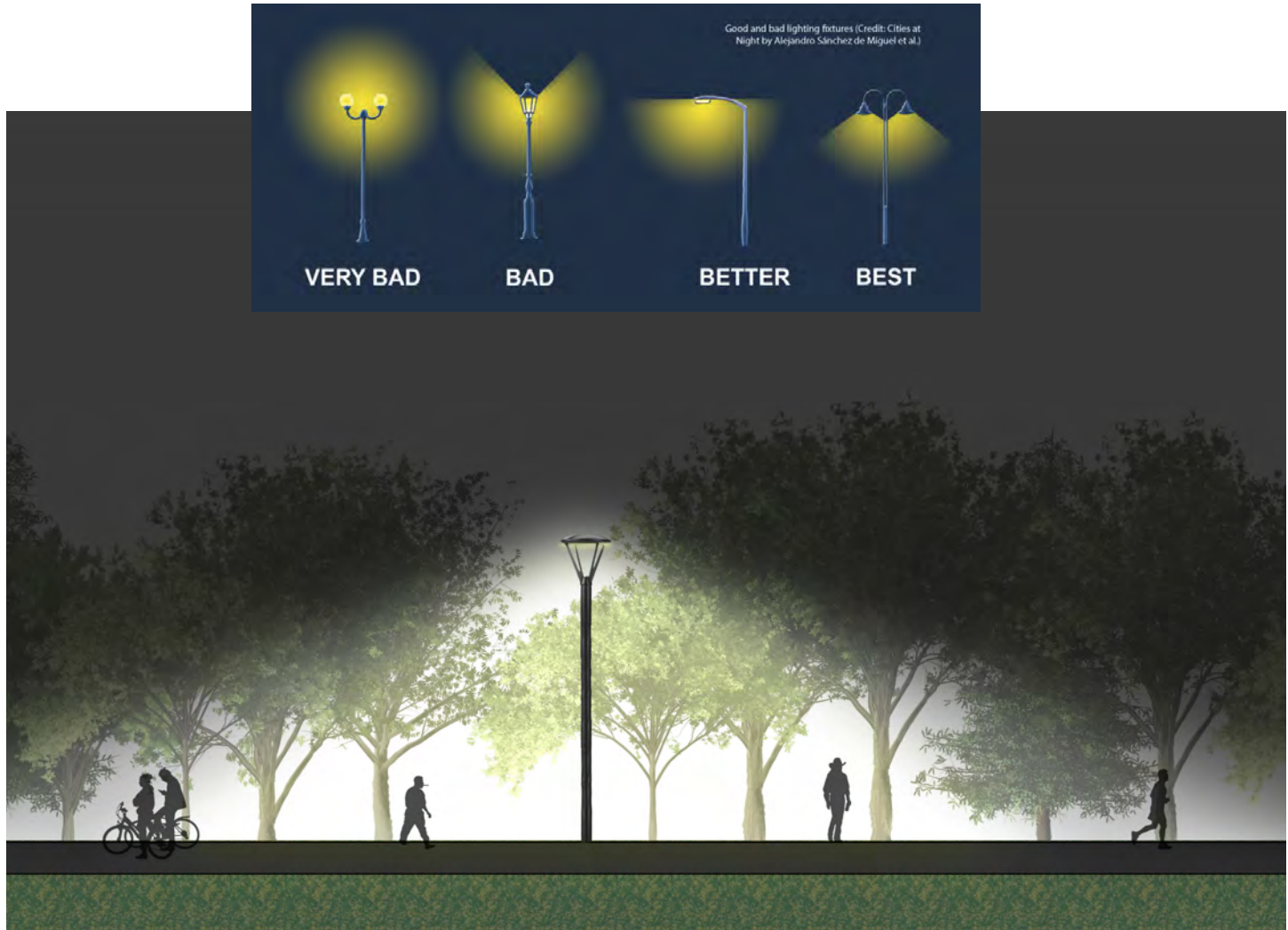


Figure 94. Controlled Light Distribution

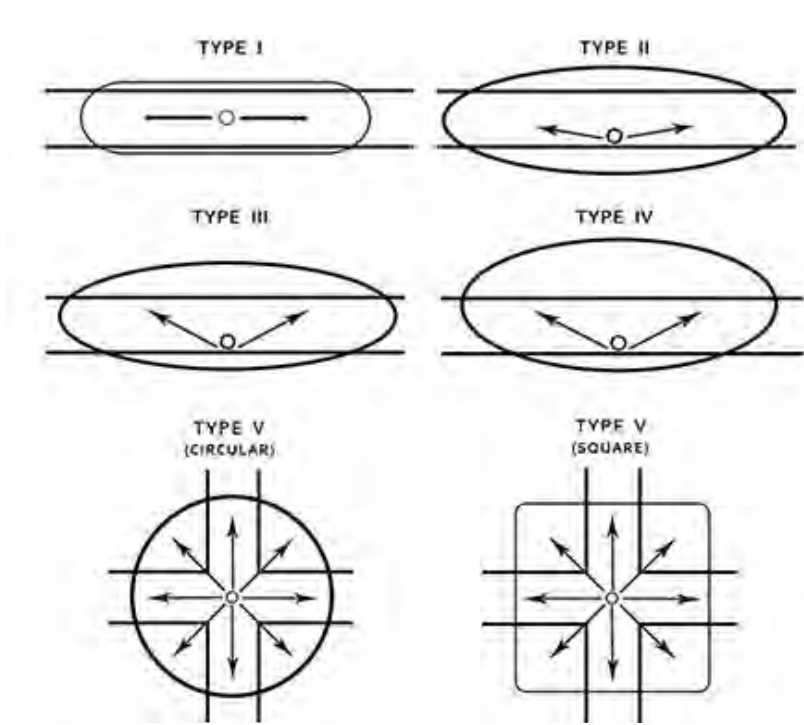
Proposed Lighting Distribution

In addition to masking the light source and keeping it focused downward, the selected horizontal light distribution is an important concept to choosing the correct luminaire. Per **Figure 96**, a Type I or Type II pattern is typically appropriate for path lighting as they provide a long and narrow light pattern.

Using a 20 foot pole and a Type II pattern yields approximately 120' of path coverage and a single fixture illumination of 0.2-foot candles. However when taken in combinations, the 0.2-foot candles combine to provide 0.4-foot candles with overlapping light levels that essentially double each other. This angle of projection is flatter than 60 degrees to get the broader spread. Closer to 65 or 70 degrees allows 60 plus feet of sideways light projection of the light along the length of the pathway.

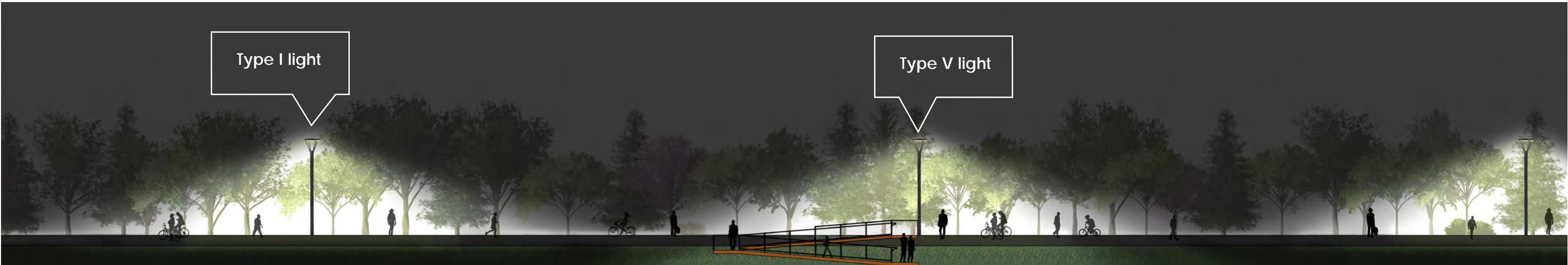
The plan sheets illustrate how public lighting along the pathway can be installed without causing light pollution to neighborhood residential or commercial property.

Figure 96. LED Light Distribution



- Type I is ideal for narrow walkways, small roads, and sidewalks.
- Type II is also long and narrow, but with a bit of a wider application and oval shape. It is ideal for ramps, wide walkways, back alleys, and entrance roadways.
- Type III is best for roadway lighting and general parking areas; it is placed on the side of an area, and the light is pushed outward.
- Type IV creates a round semicircular pattern that pushes light outward, with little illumination behind the fixture. Used on the side of buildings and the perimeter of a larger parking area.
- Type V has the largest most even distribution pattern, with light being pushed out in all directions. It is used in parking lots, roadways, and intersections.

Figure 95. LED Light Distribution



Long section showing multiple lights in sequence at 120' spacing. Note as the light angle tapers, the next light's illumination picks up, such that from 120' apart, peoples' faces would still be recognizable. The 120' illumination is also similar to the stopping distance for a vehicle so path user visibility and safety is met.

Options for Pathway Illumination

Four lighting options were considered, as shown in **Figure 97** and as described below:

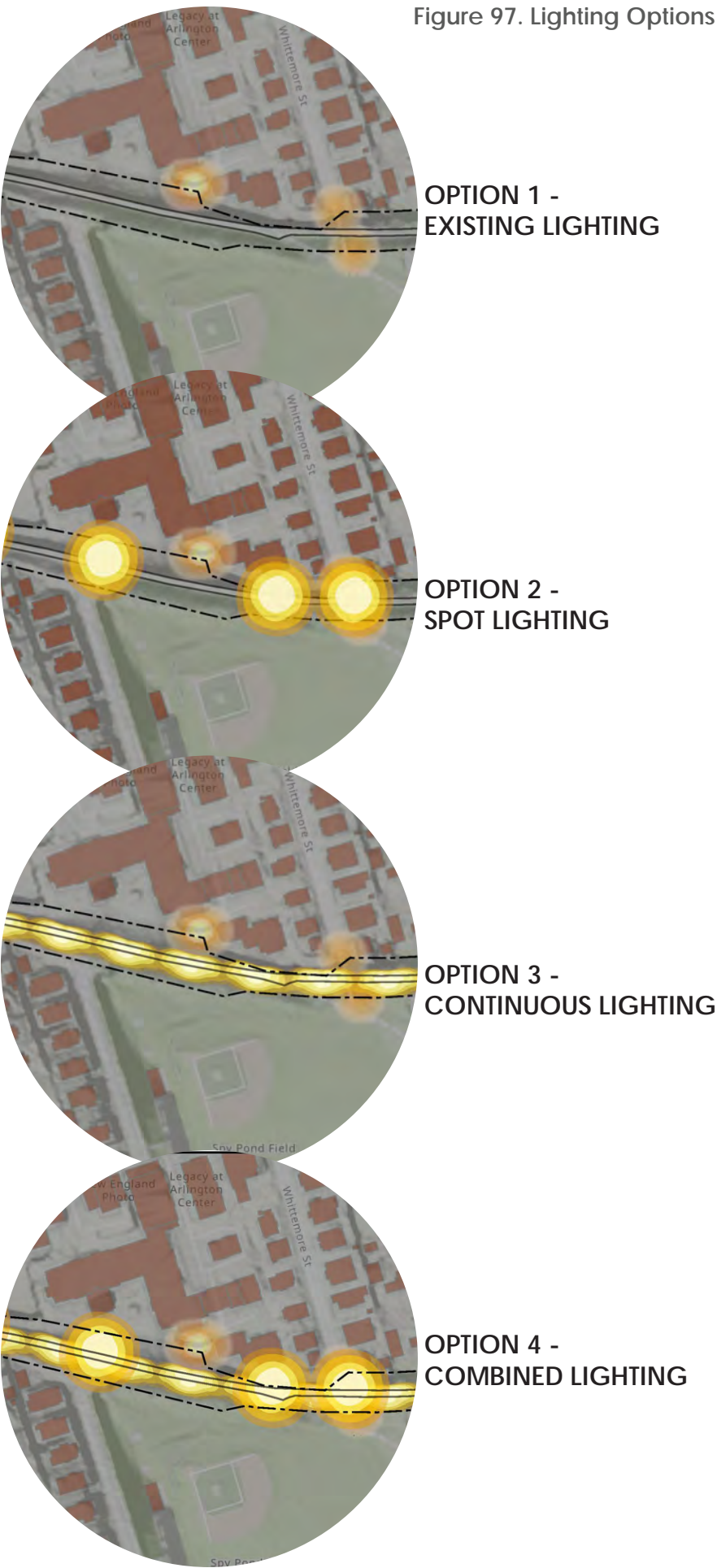
Option 1- Existing Lighting: this approach maintains the status quo, which has minimal costs but does not increase the window of use for residents and path users, and does not address current safety issues.

Option 2 - Spot Lighting: this approach utilizes a Type V lighting pattern and provides targeted safety improvements by lighting key points of access and potential conflict (i.e. entryways and street crossings).

Option 3 - Continuous Path Lighting: this approach uses a Type II lighting pattern and would benefit night time use of the path for both residents and commuters. This type of lighting is for path use, but does not necessarily target key points of access and potential conflict.

Option 4 - Combined Lighting: as its name implies, this approach combines the features of Option 2 and 3 by providing both spot lighting for safety and access and continuous path lighting for linear use.

Figure 97. Lighting Options



Hypothetical Lighting Plan

The selected plan shows **Option 4 - Combined Lighting**.

The plan includes the following types of lighting:

- Type II for pathway lighting
- Type V for spot lighting of access points and street crossings

This option provides 20-foot height, cut-off luminaires with LED lights spaced approximately 120 feet apart.

This option would achieve a maximum light level of 2.5 foot candles to provide non-glare light directly under the pole and a minimum of 0.4-foot candles at the overlap point from one luminaire's installation to the next.

A greater concentration of lights at critical points of access would also be provided.

This would provide adequate lighting at a level where people approaching each other are visible and generally recognizable from approximately 120 feet. The path itself would not have any visible areas of glare and darkness, but rather a graduated wash of light within a perceptive spectrum of illumination.

Figure 98. Hypothetical Lighting Plan

Lexington Border to Park Avenue



Lowell Street to Hill's Hill



LEGEND

-  Existing Light Source
-  Type II - Path Lighting
-  Type V - Spot Lighting

Hill's Hill to Grove Street



Grove Street to Mystic Street



LEGEND

-  Existing Light Source
-  Type II - Path Lighting
-  Type V - Spot Lighting

Mystic Street to Scannell Field



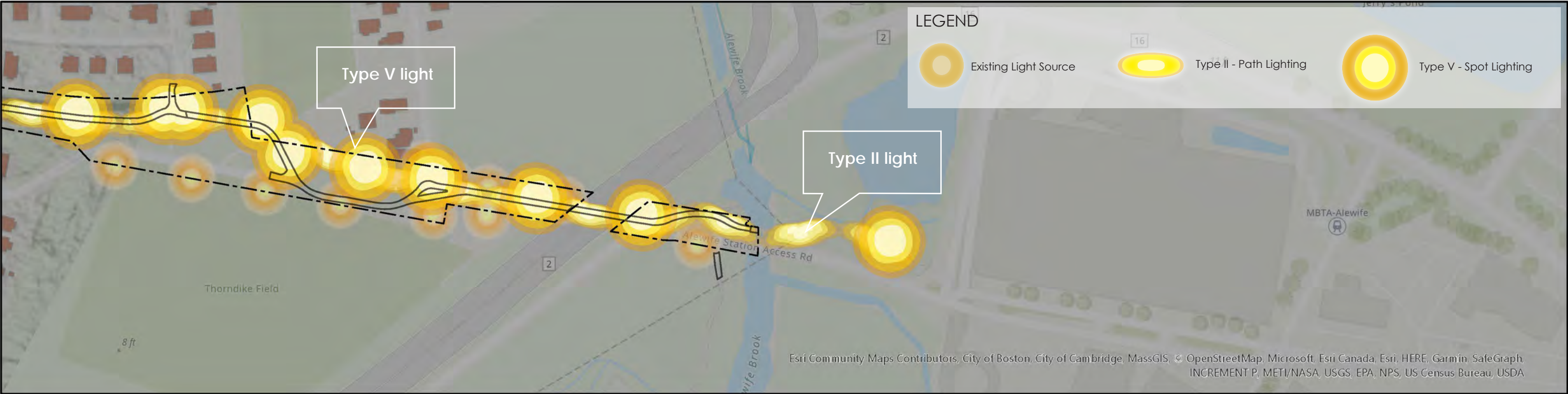
Scannell Field to Thorndike Field



LEGEND

-  Existing Light Source
-  Type II - Path Lighting
-  Type V - Spot Lighting

Thorndike Field to Cambridge Border



RECOMMENDATIONS

- 1. Historical concerns about lighting pollution and impacts to neighbors can be solved with proper design, appropriate lighting fixture selection, and technical specifications of the photometric pattern appropriate for the Bikeway setting. If lighting consideration is further pursued, a demonstration of this approach to abutting property owners could be arranged as part of a larger community outreach effort.
- 2. A high priority is lighting for safety at both at-grade and grade-separated street intersections. Because of the wider areas involved, the lighting specification for those areas should cover a broader lighting distribution pattern to cover more area of the intersection and an approach distance of at least 115 feet in each direction.
- 3. Lighting controls for the continuous lighting fixtures could have light level adjustments based on time, occupancy, or use. These could be employed later at night for energy conservation, environmental considerations, in recognition of decreased path volumes at these times, and for the benefit of abutters, who likely prefer the Bikeway be quieter and darker.
- 4. Specialized lighting could supplement fundamental illumination in special places for aesthetic and placemaking values.
- 5. A neutral lighting fixture style of attractive but not excessively ornamental (and thus expensive) design would focus on illumination of the space rather than the significant cost of fancy lights. There are many other ways that the character and aesthetics of the Bikeway can be enhanced with public art, creative placemaking, or wayfinding.

- 6. To provide safe lighting at intersections, it is estimated that approximately 40 light fixtures would need to be installed with associated light service and control.
- 7. See **Table 22** for the estimated number and cost of fixtures between the different project segments for a continuous lighting effect to be achieved. Additional operating and maintenance expenses will include the eletrical costs and the maintenance of the luminaires.

Location	Component	Qty.	Unit	Unit \$	\$	Subtotal \$
Lexington Border @ Drake Road to Park Avenue	Load Center	1	EA	\$10,000	\$10,000	\$250,000
	Conduit/Wire	3,000	FT	\$25	\$75,000	
	Pole/Fixture	22	EA	\$7,500	\$165,000	
Park Avenue to Ryder Street	Load Center	1	EA	\$10,000	\$10,000	\$238,000
	Conduit/Wire	2,820	FT	\$25	\$70,500	
	Pole/Fixture	21	EA	\$7,500	\$157,500	
Ryder Street to Grove Street	Load Center	1	EA	\$10,000	\$10,000	\$326,050
	Conduit/Wire	3,942	FT	\$25	\$98,550	
	Pole/Fixture	29	EA	\$7,500	\$217,500	
Grove Street to Mystic Street/Massachusetts Avenue	Load Center	1	EA	\$10,000	\$10,000	\$347,050
	Conduit/Wire	4,182	FT	\$25	\$104,550	
	Pole/Fixture	31	EA	\$7,500	\$232,500	
Mystic Street/Massachusetts Avenue to Linwood Street	Load Center	1	EA	\$10,000	\$10,000	\$225,250
	Conduit/Wire	2,610	FT	\$25	\$65,250	
	Pole/Fixture	20	EA	\$7,500	\$150,000	
Linwood Street to Varnum Street	Load Center	1	EA	\$10,000	\$10,000	\$336,400
	Conduit/Wire	4,056	FT	\$25	\$101,400	
	Pole/Fixture	30	EA	\$7,500	\$225,000	
Varnum Street to MBTA Alewife	Load Center	1	EA	\$10,000	\$10,000	\$170,950
	Conduit/Wire	1,938	FT	\$25	\$48,450	
	Pole/Fixture	15	EA	\$7,500	\$112,500	

Table 22. Approximate Costs of Lighting Improvements

Total = \$1,893,700
108



Chapter 6 IMPLEMENTATION

INTRODUCTION

This chapter summarizes the recommendations presented in previous chapters and identifies the timing, level of investment, and next steps for implementation. The implementation plan includes 39 recommended projects, which will be carried forward by the Town of Arlington along with critical partners in support of the vision and goals for the Minuteman Bikeway presented in Chapter 2.

Beyond infrastructure projects, there are programmatic opportunities for the Town of Arlington to enhance the Bikeway through branding campaigns, internal organization, and inter-agency partnerships. Finally, the implementation plan includes a list of potential federal, state, and local funding strategies that may be used to advance progress.

IMPLEMENTATION PLAN

The following tables summarize the implementation plan by section of Bikeway. The final table represents corridor-wide recommendations that would be implemented across the full length of the Bikeway through Arlington. Each table includes the following information:

- Project Description
- Project Type
- Specific Location (if applicable)
- Level of Investment
- Timeline
- Priority projects (indicated by blue rows in tables)

Project Types

The implementation plan includes projects within the following broad project categories:

- **Expanding and improving access** to the Bikeway at existing and additional access and entry points
 - Several existing access and entry points require improvements that will increase safety and accessibility for users entering and existing the Bikeway
 - The plan also identifies locations at which additional access points could foster better connections to Arlington's neighborhoods, schools, and businesses
- **Ongoing maintenance**, mainly of bridges and underpasses
 - Several bridges and underpasses require maintenance updates, additional access, or in some cases, full reconstruction
 - The creation of new access points on the grade-separated western portion of the Bikeway necessitates long-term projects to construct staircases or ramps
- **Short-term maintenance** along and adjacent to the Bikeway
 - Sections of the Bikeway could benefit from repaving, updating pavement markings, vegetation management, and improvements to drainage
- **Facilitating network connections** to nearby destinations and existing or proposed bicycle facilities
 - Improving connections from the Bikeway to nearby destinations and facilities will improve the broader bicycling network and help manage increasing biking and walking demand on the Bikeway
- **Improving road crossings** where the Bikeway intersects with Arlington roadways
 - Road crossings are where safety incidents are most likely to occur and where path users' safety must be prioritized.

- **Creating an immersive experience** by creating waysides and incorporating placemaking elements that support the community's vision for an immersive Bikeway
- **Updating Bikeway policies** to address demand, speed, and user etiquette
 - The clarification and revision of existing policies will improve the user experience and help reduce conflicts on the Bikeway.

Level of Investment

Implementation costs are broken into three levels of investment based on preliminary estimates. More detailed analysis is needed to determine more precise cost estimates.

- Low: <\$50,000
- Medium: \$50,000-\$100,000
- High: >\$100,000

Timeline

Projects are categorized into three levels based on anticipated project development duration. A decision on whether and how to widen the Minuteman Bikeway will impact nearly all future design decisions, especially the design of access points and waysides. Further study is needed to progress this opportunity; a conceptual design effort could be a next step to collect survey, conduct targeted public engagement, and explore corridor-wide alternatives. Prior to a decision on widening, projects with short or medium project development durations that support improving safety, access, and maintenance can generally be pursued.

- Short: < 1 year
- Medium: 1 – 3 years
- Long: 3 – 5 years

PROJECT LIST

Table 23. Project List (by Section of Bikeway)

Lexington Border to Park Avenue

Project Type & Description	Location	Investment	Timeline
Expanding and improving access Improve wayfinding through the Hurd Field Parking Lot (p. 72)	Drake Road	\$	Short
Expanding and improving access Provide more direct access between the Bikeway and Massachusetts Avenue (p. 72)	Drake Road	\$\$\$	Long
Creating an immersive experience Construct wayside and enhance interaction with Mill Brook (p. 80)	Mill Brook Crossing	\$\$\$	Long
Expanding and improving access Improve accessibility to and from Nourse Street and Lower Street Place over No-Name Brook, in partnership with the Conservation Commission (p. 72)	Nourse Street, Lower Street Place	\$\$\$	Long
Expanding and improving access Design accessible connection near Gold's Gym (p. 72)	Between Park Avenue and Lowell Street Place	\$\$	Short
Expanding and improving access Design staircase connection at northeast corner of Park Avenue underpass, to provide greater access to path from Massachusetts Avenue and Downing Square (p. 72)	Park Avenue	\$\$\$	Long

Lowell Street to Hill's Hill

Project Type & Description	Location	Investment	Timeline
Expanding and improving access Design staircase connection at Lowell Street underpass (p. 73)	Lowell Street	\$\$\$	Long
Creating an immersive experience Construct wayside and enhance interaction with No-Name Brook (p. 81)	Lowell Street/No-Name Brook	\$\$\$	Medium
Creating an immersive experience Strengthen connection to and from Mill Brook, historic Schwamb Mill, and Foot of the Rocks Memorial. Construct wayside. (p. 82)	Frazier Road/Mill Lane	\$\$	Medium
Expanding and improving access Design staircase connection at Forest Street underpass (p. 73)	Forest Street	\$\$\$	Long
Ongoing maintenance Replace Forest Street bridge (p. 63)	Forest Street	\$\$\$	Long
Expanding and improving access Promote Ryder Street access point to a premier trailhead and construct waysides (p. 83)	Ryder Street/Summer Street Field/Burns Arena	\$\$\$	Medium

Hill's Hill to Grove Street

Project Type & Description	Location	Investment	Timeline
Short-term maintenance Explore improvements on Washington Street, including repaving and incorporating improved bicycle and pedestrian accommodations. Investigate closing the end of the street to vehicle traffic. (p. 74)	Washington Street	\$\$	Long
Facilitating network connections Strengthen connection to and from Mill Brook Path and Wellington Park (p.74)	Brattle Street	\$\$\$	Long
Ongoing maintenance Create opportunities for widening by replacing or removing Brattle Street bridge (p.64)	Brattle Street	\$\$\$	Long
Expanding and improving access Improve accessibility to and from Brattle Place (p. 74)	Brattle Place	\$\$\$	Long
Facilitating network connections Improve pedestrian and bicycle accommodations on Grove Street connecting to Bikeway (p. 74)	Grove Street	\$\$	Short
Expanding and improving access Design accessible connection to and from Grove Street and create opportunities for widening by removing bridge (p. 64)	Grove Street	\$\$\$	Long

High School to Mystic Street

Project Type & Description	Location	Investment	Timeline
Expanding and improving access Improve access to and from Summer Street (p. 75)	Summer Street	\$\$\$	Long
Expanding and improving access Implement formalized connection to and from Arlington High School, to provide access to school and Mill Brook path (in process) (p. 75)	Arlington High School	\$\$\$	Short
Improving road crossings Implement proposed improvements at Mill Street intersection (pp. 84 – 85)	Mill Street	\$-\$\$	Short to Medium
Creating an immersive experience Construct wayside overlook and improved interaction with Mill Brook. Improve connection to and from Cookes Hollow and Mill Brook path. (p. 86)	Buzzell Field/Mill Brook Crossing	\$\$-\$\$\$	Long
Improving road crossings Implement proposed improvements at Water Street intersection (p. 87)	Water Street	\$	Short to Medium

Mystic Street to Scannell Field

Project Type & Description	Location	Investment	Timeline
Improving road crossings Implement proposed improvements at Mystic Street/Massachusetts Avenue intersection (pp. 88 – 90)	Mystic Street, Massachusetts Avenue, Swan Place	\$\$-\$\$\$	Short to Long
Expanding and improving access Improve accessibility to and from Spy Pond Field and Whittemore Street pedestrian underpass (p. 91)	Spy Pond Field, Whittemore Street	\$\$\$	Short
Expanding and improving access Reconstruct access ramp to Spy Pond Field and stairs at Whittemore Street (p. 91)	Spy Pond Field, Whittemore Street	\$\$\$	Long
Facilitating network connections Improve pedestrian and bicycle accommodations on Pond Lane (p. 92)	Pond Lane	\$\$	Long
Expanding and improving access Design accessible connection to and from Pond Lane and create opportunities for widening by removing bridge (p. 66)	Pond Lane	\$\$\$	Long
Creating an immersive experience Construct wayside pocket park and improved access to Pond Lane (p. 92)	21 Pond Lane	\$\$	Long
Creating an immersive experience Construct wayside pull-off area and overlook (p. 93)	Spy Pond Overlook	\$\$	Long
Improving road crossings Implement proposed improvements at Linwood Street intersection (pp. 94 – 95)	Linwood Street	\$-\$\$	Short to Medium

Scannell Field to Thorndike Field

Project Type & Description	Location	Investment	Timeline
Expanding and improving access Improve accessibility to and from Orvis Circle and enhance Bikeway experience (p. 96)	Orvis Circle	\$-\$\$	Short
Improving road crossings Implement proposed improvements at Lake Street (p. 97)	Lake Street	\$\$	Short to Long

Thorndike Field to Cambridge Border

Project Type & Description	Location	Investment	Timeline
Expanding and improving access Improve accessibility to and from Varnum Street in the short-term (p. 98)	Varnum Street	\$	Short
Expanding and improving access Improve accessibility to and from Varnum Street in the long-term (p. 98)	Varnum Street	\$\$\$	Long
Expanding and improving access Improve accessibility to and from Thorndike Street (p. 78)	Thorndike Street	\$	Medium
Facilitating network connection Strengthen connection to and from Alewife Greenway Linear Path (p. 78)	Near Thorndike Street	\$\$	Medium
Short-term maintenance Remove bollard bases and construct temporary ramps on Alewife Brook bridge (p. 29)	Cambridge Border	\$	Short
Ongoing maintenance Modify or replace Alewife Brook bridge (p. 29)	Cambridge Border	\$\$\$	Long

Corridor-Wide

Project Type & Description	Investment	Timeline
Ongoing maintenance Implement continuous lighting plan (pp. 104 – 108)	\$\$\$	Long
Ongoing maintenance Coordinate with the MBTA to conduct thorough bridge inspections of all bridges and underpasses along the Bikeway (p. 15)	\$\$	Short
Expanding and improving access Explore widening the Bikeway at key locations where demand is high and where there is widening potential based on available right-of-way and topography (pp. 62 – 68)	\$\$\$	Long
Ongoing maintenance Repave sections of the Bikeway with uneven asphalt due to heaves, extensive asphalt patching, or where transitions between surface materials have become hazards; as sections are repaved, use root barriers, when possible (p. 29)	\$\$-\$\$\$	Short
Ongoing maintenance Develop a maintenance program for vegetation management including consistent edge mowing, clearing of areas, and the development of a native planting plan (p. 28)	\$\$	Short
Ongoing maintenance Incorporate design elements that manage speeds (calm traffic) in conjunction with other construction opportunities such as repaving, the design of new access points, or widening (pp. 69 – 70)	\$\$	Medium to Long
Short-term maintenance Identify areas which commonly experience pooling of standing water and remedy with formal drainage treatments (p. 29)	\$\$\$	Short
Short-term maintenance Perform maintenance widening in areas where vegetation has reduced the functional width of the Bikeway (p. 56)	\$	Short
Short-term maintenance Develop a Bikeway maintenance program (p. 27)	\$	Short
Facilitating network connections Implement recommended bicycle network, as outlined in <i>Connect Arlington</i> (p. 23)	\$\$\$	Long
Updating Bikeway policies Establish a target speed and communicate expected speed with users (pp. 21 – 22)	\$	Short
Updating Bikeway policies Expand and clarify motorized vehicle policies and communication (pp. 22 – 23)	\$	Short
Updating Bikeway policies Develop and communicate updated user etiquette guidance through new signs, messaging, and public events (pp. 24 – 25)	\$	Short
Updating Bikeway policies Modify and update regulatory and warning signage along the Bikeway (pp. 30 – 32)	\$\$	Short
Updating Bikeway policies Modify and update wayfinding signage along and adjacent to the Bikeway (pp. 33 – 50)	\$\$	Short
Updating Bikeway policies Update Bikeway markings, user guidance, and signage to clarify and establish user envelopes (p. 69)	\$\$	Short

PROGRAMMING

The Town of Arlington has the opportunity to enhance the Bikeway through programming initiatives that engage the public, other town staff, and other stakeholders. These initiatives are summarized in **Table 24** below.

Table 24. Recommended Programming Initiatives

Programming Initiative
Coordination with MBTA Establish a working relationship with the MBTA Real Estate Group and invite them to become an active stakeholder and steward of the Bikeway
Coordination with municipalities Coordinate with Cambridge to clarify maintenance responsibility of the bridge over Alewife Brook; Consider establishing a Memorandum of Understanding with Cambridge to reach a shared approach for maintenance near Alewife; Continue ongoing coordination with Lexington and Bedford to maximize consistency between Bikeway policies
Coordinate with Abutters Consider branding to distinguish between public and private access points; Consider adding path turn-offs using stabilized aggregate or other soft-surface treatments; Develop design guidance for developers or private entities to ensure consistency at access points
Plan Seasonal or Annual Events Develop consistent event programming, which could include “Learn to Ride” days, vegetation maintenance volunteer days, or active waysides

FUNDING SOURCES

The following outlines a series of potential resources that the Town of Arlington can use to explore funding for active transportation projects. Sources are separated by federal, state, local, and private/non-profit opportunities in **Table 25** through **Table 28**.

Table 25. Potential Funding Strategies: Federal

Source	Eligibility/Requirements/Purpose
TRANSPORTATION ALTERNATIVES (TA)	Funding source under the FAST Act Funds may be used for a variety of pedestrian, bicycle, and streetscape projects including sidewalks, bikeways, side paths, and rail-trails. TA funds may also be used for selected education and encouragement programming such as Safe Routes to School.
SURFACE TRANSPORTATION BLOCK GRANT PROGRAM (STBG)	Provides states with flexible funds which may be used for a variety of highway, road, bridge, and transit projects. Eligible projects can incorporate trails, sidewalks, crosswalks, pedestrian signals, and ADA upgrades to sidewalks. Unlike most highway projects, STBG-funded pedestrian facilities may be located on local and collector roads

	which are not part of the Federal-aid Highway System.
	STBG funds are run through the Boston MPO TIP process.
CONGESTION MITIGATION/AIR QUALITY PROGRAM (CMAQ)	<p>Funding for projects and programs in air quality non-attainment and maintenance areas for ozone, carbon monoxide, and particulate matter which reduce transportation related emissions</p> <p>Can be used to build bicycle and pedestrian facilities that reduce travel by automobile. Purely recreational facilities generally are not eligible.</p>
SAFE ROUTES TO SCHOOL (SRTS) PROGRAM	Eligible SRTS projects should substantially improve the ability of students to walk and bike to school. These can include pedestrian and bicycle crossing improvements as well as off-street pedestrian and bike facilities.
RAISE TRANSPORTATION DISCRETIONARY GRANT PROGRAM	Formerly known as TIGER/BUILD grants, Rebuilding American Infrastructure with Sustainability and Equity (RAISE) grants are awarded to projects that meet safety, environmental sustainability, quality of life, economic competitiveness, state of good repair, innovation, and partnership criteria.
SAFE STREETS AND ROADS FOR ALL GRANT PROGRAM (SS4A)	Established by the Bipartisan Infrastructure Law (BIL), the SS4A program funds the development of safety action plans (Action Plan); planning, design, and development activities in support of an Action Plan; and projects and strategies identified in an Action Plan.
COMMUNITY DEVELOPMENT BLOCK GRANT PROGRAM (CDBG)	The CDBG Program supports community development activities, including infrastructure projects, to build stronger and more resilient communities. Eligibility is based on population data and funding is targeted principally for low- and moderate-income populations.

Table 26. Potential Funding Strategies: State

Source	Eligibility/Requirements/Purpose
MASSDOT SAFE ROUTES TO SCHOOL (SRTS) INFRASTRUCTURE GRANT	<p>Eligible projects include infrastructure projects that will improve safety and/pr increase the number of children walking and biking to school and are located within two miles of a school serving children in any grades between kindergarten to eighth grade.</p> <p>Project types include pedestrian and bicycle crossing improvements, off-street bicycle and pedestrian facilities, and secure bicycle parking facilities.</p>

MASSTRAILS GRANTS	Awards up to \$500,000 per award annually for project development, design, engineering, permitting, construction, and maintenance of shared use pathways.
SHARED STREETS AND SPACES GRANT PROGRAM	Funds may be used for quick-launch improvements to public health, safe mobility, and strengthened commerce in Massachusetts municipalities.
COMPLETE STREETS FUNDING PROGRAM	Provides technical assistance and construction funding to municipalities that have developed a complete streets prioritization plan.

Table 27. Potential Funding Strategies: Local

Source	Eligibility/Requirements/Purpose
CHAPTER 90 PROGRAM	<p>Chapter 90 entitles cities and towns to receive reimbursements on capital improvement projects such as highway construction, preservation, and improvement projects, including bikeways, sidewalks, footbridges, traffic controls and related facilities, right-of-way acquisition, project associated tree planting/landscaping, and construction.</p> <p>The Town of Arlington receives formula allocations directly from the state.</p>
COMMUNITY PRESERVATION ACT (CPA)	<p>The Massachusetts CPA can be used by municipalities that have adopted a local Community Preservation Act to design, acquire land for, and construct paths.</p> <p>The Town of Arlington has adopted the CPA and the CPA Committee has a process for requesting funds each year.</p>
TOWN OF ARLINGTON	The Town of Arlington funds a limited number of projects via special appropriation and the capital improvement program.

Table 28. Potential Funding Strategies: Private/Non-Profit

Source	Eligibility/Requirements/Purpose
THE LAWRENCE & LILLIAN SOLOMON FOUNDATION	Supports greenway and public park projects, including preliminary design studies, public engagement, and implementation strategies intended to introduce people to a greenway, to animate public spaces and discourse, and test feasibility of designs
BARR FOUNDATION	Supports projects within six program areas, including climate. Often funds technical assistance programs, through which towns can access consulting services.
RAILS TO TRAILS CONSERVANCY GRANT PROGRAM	Supports investments that support significant regional and community trail development goals including building, maintaining, and managing trails. Grants are typically small in scope.

ADMINISTRATIVE STRATEGY

Project implementation and ongoing maintenance does not always fall clearly within the role sand responsibilities of a specific Arlington department. This section provides documentation of the typical roles and responsibilities for a Bikeway project, based on the project type. Clear coordination and collaboration among Town departments will contribute to the success of these projects.

Table 29. Bikeway Project Development Responsibilities

Project Responsibility	Project Type	Project Stakeholders
Public Works	Ongoing maintenance	Conservation Commission MBTA Real Estate Group Arlington Bicycle Advisory Committee Town Manager Adjacent Municipalities
	Short-term maintenance	Conservation Commission MBTA Real Estate Group
Department of Planning and Community Development	Expanding and improving access	Public Works (Parks and Fields Department, Highway Department) Conservation Commission MBTA Real Estate Group Abutters Arlington Bicycle Advisory Committee Recreation Department
	Facilitating network connections	Public Works (Highway Department) Arlington Bicycle Advisory Committee MassDOT
	Improving road crossings	Public Works (Highway Department) Arlington Bicycle Advisory Committee Arlington Police Department The Select Board
	Updating Bikeway policies	Arlington Police Department Arlington Bicycle Advisory Committee Town Manager

Appendix A

Existing Conditions Report

THIS PAGE LEFT INTENTIONALLY BLANK

*Town of Arlington
Minuteman Bikeway
Planning Project*



Chapter 1
**EXISTING
CONDITIONS**

February 2022

Prepared for:

Town of Arlington Department of Planning and
Community Development

Town of Arlington Community Preservation Act
Committee

Project Team:

Adam Chapdelaine

*Town Manager,
Town of Arlington*

Daniel Amstutz, AICP

*Senior Transportation Planner,
Department of Planning and Community Development*

Jennifer Rait

*Director,
Department of Planning and Community Development*

Susan Chapnick

*Chair,
Conservation Commission*

Tim Lecuivre

*Tree Warden,
Department of Public Works*

Ann LeRoyer

*Chair,
Open Space Committee*

David Morgan

*Environmental Planner/Conservation Agent,
Department of Planning and Community Development*

Michael Rademacher

*Director of Public Works,
Department of Public Works*

Corey Rateau

*Police Traffic Division,
Arlington Police Department*

Christopher Tonkin

*Chairman,
Arlington Bicycle Advisory Committee*

Kittelson & Associates

Elizabeth Flanagan, AICP

Conor Semler

Caitlin Mildner

Megan Morrow

Alec Donowitz

GPI

Ronald Headrick, RLA

Michael J. Shustack, PE

Nicole Rogers, PE

Sage Winter, ASLA, PLA

Contents

<u>INTRODUCTION</u>	<u>2</u>
<u>DOCUMENT REVIEW</u>	<u>6</u>
<u>PATH VOLUMES</u>	<u>12</u>
<u>CRASH HISTORY</u>	<u>15</u>
<u>ENTRY AND ACCESS POINTS.....</u>	<u>17</u>
<u>WAYSIDES AND TRAILHEADS.....</u>	<u>21</u>
<u>LIGHTING</u>	<u>25</u>
<u>SIGNAGE</u>	<u>28</u>
<u>ARTWORK</u>	<u>30</u>
<u>INTERSECTIONS.....</u>	<u>33</u>
<u>MAINTENANCE PRACTICES.....</u>	<u>38</u>
<u>BRIDGES.....</u>	<u>40</u>
<u>DRAINAGE.....</u>	<u>42</u>
<u>WIDTH AND ENGINEERING CONSTRAINTS FOR WIDENING</u>	<u>44</u>
<u>APPENDIX A: EXISTING CONDITIONS.....</u>	<u>49</u>
<u>APPENDIX B: BRIDGE OVER ALEWIFE BROOK ASSESSMENT.....</u>	<u>54</u>
<u>APPENDIX C: STANDARD SPECIFICATIONS FOR THE FAIRWAY MODEL PEDESTRIAN & LIGHT VEHICULAR BRIDGE.....</u>	<u>57</u>

INTRODUCTION

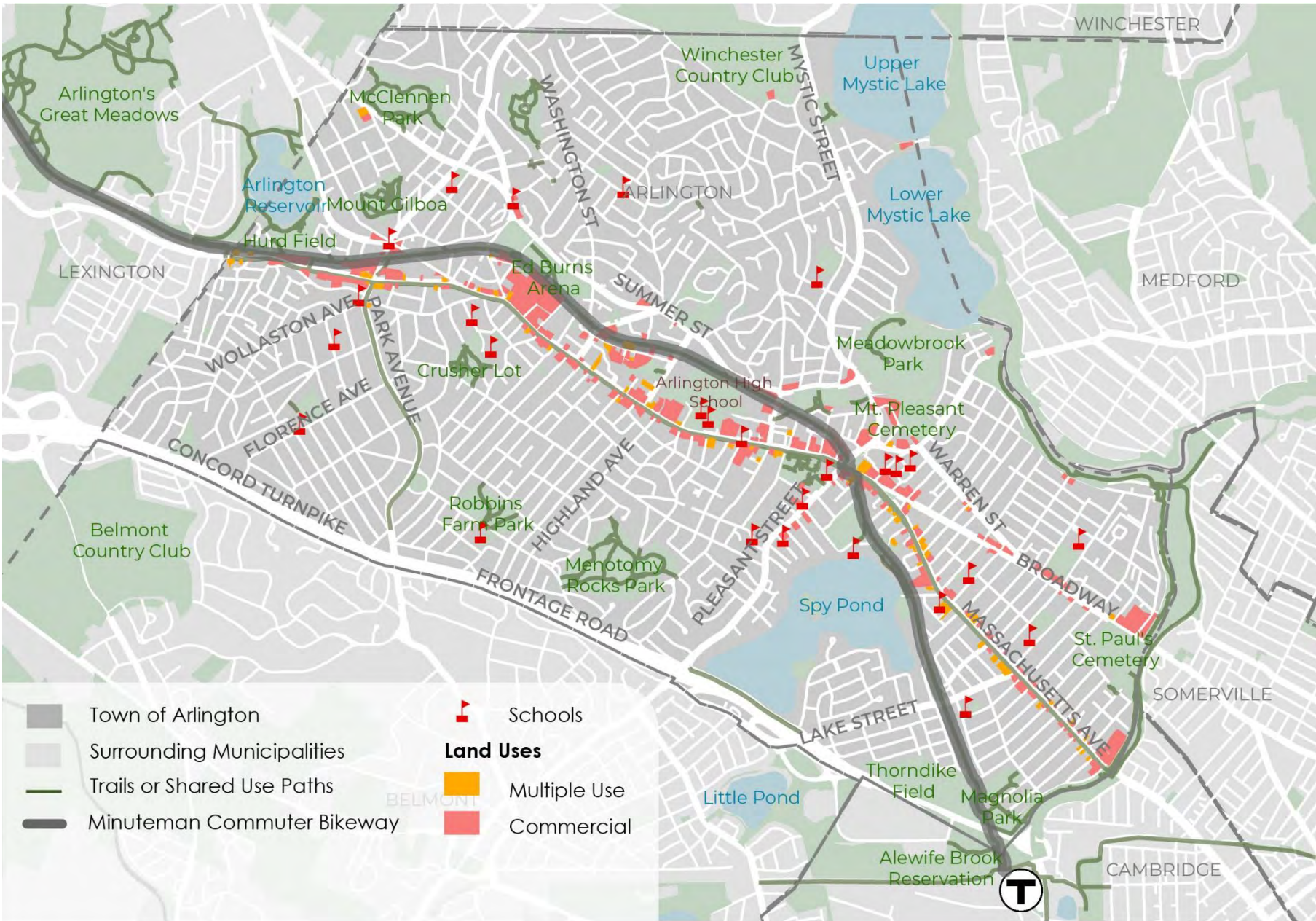
The Minuteman Commuter Bikeway (Bikeway) is a ten-mile, regional shared-use path extending through Bedford, Lexington, and Arlington and connecting to the Alewife MBTA station in Cambridge. The Bikeway was built in 1993 along disused Massachusetts Bay Transportation Authority (MBTA) rail right-of-way. The Town of Arlington leases the property for the 3.6 miles within its boundaries from the MBTA (**Figure 1**) and is responsible for the maintenance and upkeep of the Bikeway. Roughly paralleling Massachusetts Avenue, which is the primary transportation and commercial corridor through the town, the Bikeway is a critical, off-street transportation and recreation facility that is heavily used by people of all ages and abilities, using different modes, and with different needs and speeds.

Figure 1: Minuteman Bikeway Extents



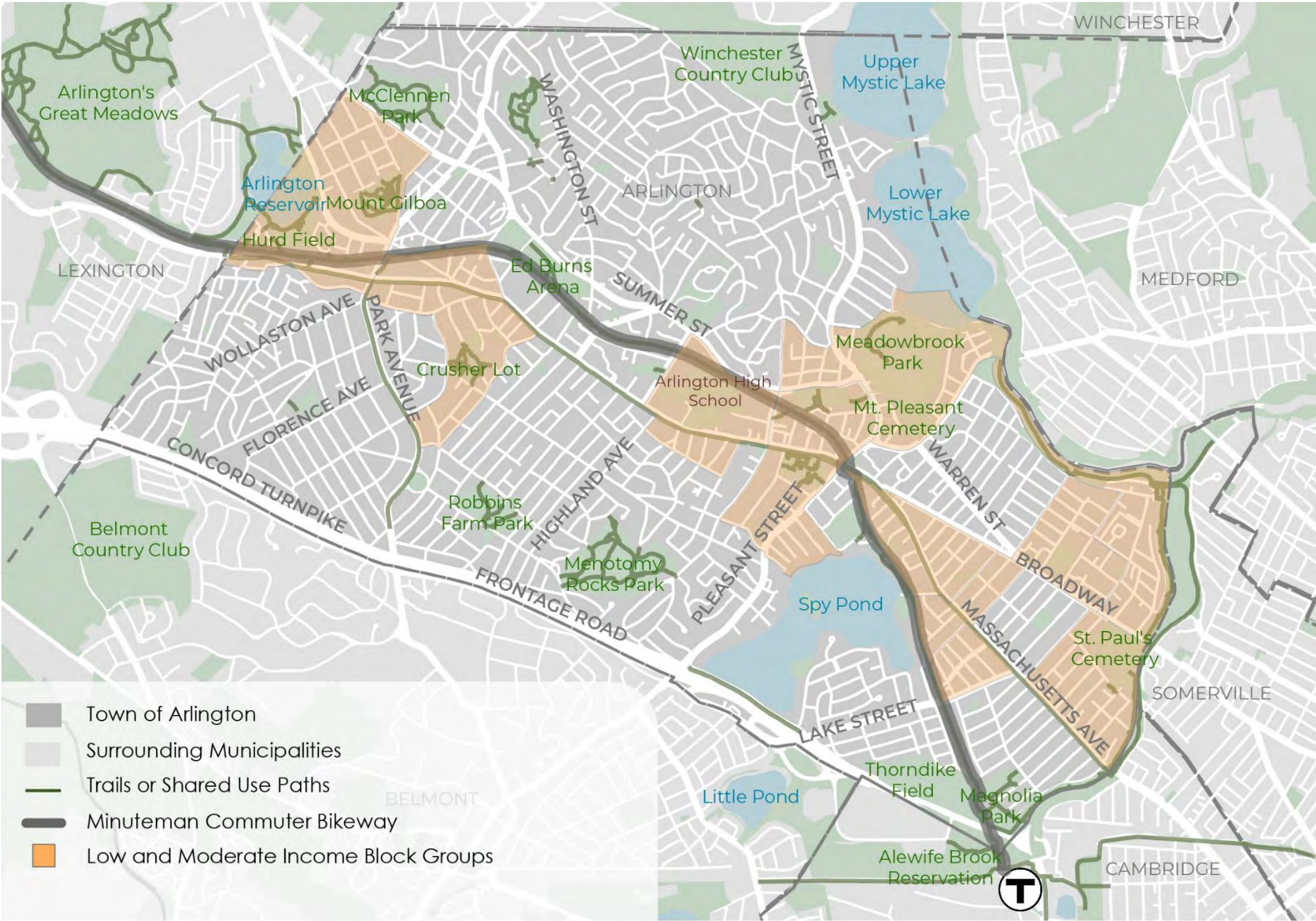
Among its many benefits, the Bikeway in Arlington provides a safe route across Town, allowing residents and commuters from neighboring communities to choose walking or biking to key destinations instead of driving. Because the Bikeway parallels Massachusetts Avenue, it is a logical means to access businesses and municipal facilities located along the arterial and the three main commercial districts of Arlington Heights, Arlington Center, and East Arlington. **Figure 2** shows the parcel-level commercial and mixed land uses throughout Arlington, highlighting the concentration of destinations and opportunities accessible via the Bikeway. The path provides direct access to multiple schools, including Arlington High School, which abuts the path, and Hardy Elementary School. It also connects to a number of open space and recreational facilities, including Hurd Field, Ed Burns Arena, Buzzell Field Park, Spy Pond, and Magnolia Park/Thorndike Field. The Low- and Moderate-Income Census Block Groups in Arlington (**Figure 3**) largely border Massachusetts Avenue and the Bikeway; the Bikeway is an important transportation corridor that connects the Town's most vulnerable populations to key destinations safely and affordably. Furthermore, the Bikeway itself is a destination, granting path users access to green space, trees, and public art, separated from vehicle stress, noise, and pollution.

Figure 2: Key Destinations in Arlington



Key Destinations

Figure 3: Low- and Moderate-Income Census Block Groups



Low and Moderate Income Block Groups

The Minuteman Bikeway in Arlington is a highly utilized and much-loved facility. However, it faces challenges due to its success, including crowding and speed disparities between users. Although the Bikeway is more comfortable than riding in or walking alongside vehicle traffic, the density of users leads to discomfort and safety concerns. At-grade roadway crossings also present challenges for safety and comfort. While sections have been rehabilitated, the Bikeway has not been fully repaved since its construction and faces on-going maintenance challenges. Over time, the Bikeway has accumulated a patchwork of design interventions, placemaking elements, and maintenance, leading to an inconsistent and unpredictable experience. This study reviews and assesses the key challenges facing the Bikeway throughout its extents in Arlington to understand how to keep the Bikeway safe and accessible to all types of users and to plan for future investments.

The project team assessed existing conditions on the Bikeway. The assessment included a review of existing documents and policies, field visits and observations, data analysis, and a public survey. The team documented and evaluated the existing conditions of the following elements:

- Planning documents, bikeway use policies, use agreements, zoning, and new development
- Path volumes
- Crash history
- Entry and access points
- Waysides and Trailheads
- Signage
- Artwork
- Intersections
- Maintenance practices
- Bridges
- Drainage
- Width and Engineering Constraints for Widening

DOCUMENT REVIEW

The project team reviewed past planning efforts, use policies and agreements, and upcoming project information to understand existing policies related to the Bikeway and to review what has already been planned, proposed, or recommended for the corridor. This section summarizes relevant findings from this review.

Past Planning Efforts

Navigating the Minuteman Commuter Bikeway (2014)

Navigating the Minuteman Commuter Bikeway is a plan that recommends infrastructure improvements, programs, and policies to ensure the Bikeway retains its attractiveness as a commuter bikeway and continues to accommodate new users in the future. The plan includes recommendations for wayfinding and signage, intersection improvements, trailhead and waysides, partnerships, community outreach, policing and public safety, maintenance, and future improvements. The plan covers the Bikeway in Arlington, Lexington, and Bedford, and outlines corridor-wide consistency recommendations. However, it does not go into specific detail for each town.

Arlington Master Plan (2015)

The *Arlington Master Plan* is a comprehensive plan adopted by the Arlington Redevelopment Board. The plan considers a range of topics that contribute to civic connections, encourage social interaction, and foster a sense of community within the town. The following issues, opportunities, and recommendations identified in the plan are relevant to the Bikeway:

- The plan identifies several redevelopment opportunity areas close to the Bikeway, including Massachusetts Avenue and the Mill Brook district.
- The plan acknowledges the difficulties of certain crossing locations of the Bikeway and the impacts on congestion, traffic circulation, and safety. These locations include the intersections with Massachusetts Avenue (Arlington Center), Mill Street, and Lake Street.
- The plan acknowledges that the Bikeway does not have lighting, which may deter users in the winter months when the sun sets before the end of the workday, and that some segments have worn pavement and edge erosion. In addition, there is a lack of physical and cultural connections between the Bikeway and commercial establishments.
- Recommendation: Improve conditions, access, and safety for bicyclists on the Minuteman Bikeway and on local streets. Strengthen connections between the Minuteman Bikeway and commercial districts to increase customers without increasing a need for on street parking.
- Proposed Action: Address ADA requirements and improve lighting, signs and signalization at street crossings for the Minuteman Bikeway to give more visibility to pedestrians and bicyclists and control traffic speeds.

2. Massachusetts Avenue has the capacity for growth. It can support mixed-use development commensurate with its function as Arlington's primary commercial corridor. Massachusetts Avenue is accessible to neighborhoods throughout the town, it has frequent bus service, bicycle routes, and good walkability. Increased density through greater building heights and massing would benefit the corridor from an urban design perspective and benefit the town from a fiscal perspective.

Capacity for growth on Massachusetts Avenue, including transit and improved multimodal access, is a key recommendation from the *Arlington Master Plan*.

- Proposed Action: Provide safe connections between the Minuteman Bikeway and the three main commercial centers (Arlington Heights, Arlington Center, and East Arlington). Equip corridors with wayfinding signage to direct path users between the path and the commercial centers, including a map directory of local businesses along the path.

These recommendations are expanded upon in *Connect Arlington* (see below) and demonstrate that the Bikeway continues to be a critical point of concern and planning.

Arlington Net Zero Action Plan (2021)

Arlington's Net Zero Action Plan was endorsed by the Select Board in August 2021 as a roadmap to reduce the Town's greenhouse gas pollution to net zero by 2050. This plan outlines the Town's motivation for achieving "net zero" and the roadmap for implementation, including measures related to buildings, mobility, and clean energy supply. The Bikeway is acknowledged as an important component of existing and future progress toward zero emissions mobility.

Connect Arlington (2021)

Connect Arlington is the Town's sustainable transportation plan, endorsed by the Select Board in July 2021. This plan outlines a 20-year strategy to ensure that Arlington's residents, workers, business owners and visitors are provided a safe, reliable, and multimodal transportation network that meets the needs of people of all ages and abilities. The following strategies identified in the plan are relevant to the Bikeway:

- Complete the Minuteman Bikeway Study and implement recommendations that increase access to and capacity and safety on the pathway to ensure that it remains a comfortable active transportation facility for all active transportation users – recreational or commuter – including bicyclists, runners and walkers.
 - Prioritize opportunities to separate bicyclists from pedestrians to expand capacity and enhance comfort and safety.
 - Develop and implement comprehensive wayfinding and user safety program for the Bikeway.
 - Install lighting to increase visibility and safety along the pathway at night.
 - Improve and add additional neighborhood connections.
- Develop educational programs that promote safe travel behaviors by ALL users.
 - Share the Path - The Minuteman Bikeway is a heavily used multiuse path. Developing a comprehensive safety program through enhanced signage, pavement markings, separated use, and other user information would help to inform those not versed in how to successfully share the path. The Town has provided Community Preservation Act (CPA) funding to study potential safety improvements along the Minuteman Bikeway.

Rapid Recovery Plan (2021)

The Local Rapid Recovery Planning program provided grant funding to communities across Massachusetts to assess impacts from COVID-19 and develop actionable, project-based recovery plans tailored to the unique economic challenges in downtowns, town centers, and commercial districts. Arlington, Bedford, and Lexington jointly applied for assistance from the program to promote recovery in the Arlington Heights, Bedford Center, and East Lexington Business Districts, with emphasis on capitalizing on the Minuteman Bikeway, a common asset among these three areas. The plan acknowledges that the Bikeway provides insufficient wayfinding, resulting in missed

opportunities to attract Bikeway users to businesses, and that physical and visual issues affect access to and from the Bikeway. The following recommendations address these issues:

- Design and install wayfinding signage and other elements to encourage Bikeway users to patronize the Business Districts
- Connect the Bikeway to the Districts via designated access way improvements (e.g., pavement markings, design elements), especially at Bow Street, Park Ave, and Depot Park to the Narrow Gauge Rail Trail.
- Create a well-marked public “at-grade” accessway from the Bikeway through the parking lot at 30 Park Ave.
- Create a mural program (especially for public locations and businesses adjacent to the Bikeway).

Bikeway Projects

Arlington Center Safe Travel Project (2016)

The *Arlington Center Safe Travel Project* was a project led by MassDOT with construction beginning in April 2016. An important goal of this effort was to provide a safe connection for the Bikeway across Massachusetts Avenue and through Arlington Center. As a result of this project, bicycle lanes and a two-stage left-turn box were installed on Massachusetts Avenue. Additional components included improving pedestrian safety and sidewalk infrastructure, and upgrading signal equipment, phasing, and timing.

Lake Street/Bikeway Intersection Design Project (2020)

As a result of the Lake Street Corridor Project, the Arlington Transportation Advisory committee recommended pursuing a new signal at Lake Street and the Bikeway crossing to improve traffic delay and to provide a more orderly, predictable crossing for both Bikeway and Lake Street users. Construction of a new traffic signal, including a bicycle signal for path users, and improved path entrances and crossing markings concluded in Fall 2020.

Bikeway Use Policies in Arlington

- The Tri-Town Bike Committee is made up of volunteer representatives from Arlington, Lexington, and Bedford Bicycle Advisory Committees and typically meets twice a year to discuss issues related to the Bikeway. Although there is no official guidance at the time of writing, the committee has been considering various use policies including a non-regulatory speed limit, a suggested passing distance, stopping and/or yielding behavior at intersections, electric bicycle allowances, and the use of other personal mobility devices such as e-scooters or Onewheels.
- Guidelines for Event Use of the Donald R. Marquis Minuteman Trail (Minuteman Commuter Bikeway) (2013)
 - This document outlines principles which the Town Manager may consider when responding to requests for special uses/events on the Bikeway, including safety, transparency, and consistency in policies and decision-making. This policy was developed to protect the unimpeded use of the Bikeway for travel use and to provide guidelines consistent with those in the Lexington portion of the Bikeway. The policy also outlines detailed guidelines for special event permit requests, which are required for any event where a group of more than 35 participants are using the Bikeway. This policy is currently unofficial and has not been explicitly approved.

- Memorandum: Proposed Speed Limit for the Minuteman Bikeway (2020)
 - At the request of the Lexington Bicycle Advisory Committee (LBAC), the Arlington Department of Planning and Development explored the installation of a non-regulatory speed limit (15 mph) on the Arlington section of the Bikeway. The goal of this speed limit would be to reduce the speeds of bicyclists that were making lower-speed users uncomfortable and creating hazardous conditions for all users of the Bikeway. Based on a review of the potential benefits and disadvantages of such a policy, the Department recommended that a speed limit on the Bikeway was not appropriate at that time.
- Bikeway Operating Hours (2020)
 - The Arlington Bicycle Advisory Committee worked with the Arlington Police Department on a proposal to amend the operating hours of the Bikeway, which previously mirrored that of all parks in town (5 AM – 9 PM). At a Special Town Meeting in Fall 2020, a substitute motion passed which removed all hours of usage from the bikeway.

Use Agreements

- In September 1988, the Town of Arlington acquired land known as the “Alewife Reservation – Minuteman Bikeway Line” using funds granted by the Massachusetts Urban Self-Help Program. This agreement authorized the Town to develop, manage, maintain, and operate the project (the Bikeway) on this land. Additional land was acquired via eminent domain for the use of the Bikeway in November 1988. These agreements require that the Town uses the land only for the park, recreation, or conservation purposes.
- In June 1997, the Town of Arlington entered into a License Agreement with the Massachusetts Bay Transportation Authority (MBTA) in which the MBTA agreed to license the Town in the right and privilege to use a segment of the line of railroad known as the Lexington Branch between the Cambridge/Arlington boundary line and the Arlington/Lexington boundary line. In this agreement, the Town agreed to use this segment as a “bikeway” established for the “passage of bicycles without motive power.” This agreement requires that all construction in the Bikeway be granted written approval by the MBTA's Chief Engineer of Railroad Operations. In addition, Arlington may be required to remove any construction not so approved. This License Agreement shall continue unless and until MBTA shall give notice to Arlington that it intends and elects to terminate the license on the grounds that the line segment is required for MBTA for mass transit extension or that regulations or orders of appropriate regulatory authority require such termination.
- An Order of Conditions pertaining to the Massachusetts Wetlands Protection Act and the Arlington Bylaw for Wetlands Protection was issued in 2000 to Metromedia Cable. This was in relation to a parallel right-of-way to the Bikeway that the Town leased to Metromedia for a conduit containing fiber optics cables.
- An MBTA Railroad Operations Directorate from August 2014 outlines specific guidelines and procedures for construction on MBTA railroad property, which includes the property on which the Bikeway is situated. All proposed construction on or accessing the Bikeway must follow these guidelines.

Zoning

The Town of Arlington Zoning Bylaw was adopted by Town Meeting in February 2018. The Bikeway is zoned as a Transportation District. This document includes bylaws related to the installation, location, use, and maintenance of signs. Bylaws pertaining to non-accessory signs, or those that are not related to the lawful use of the lot upon which the sign is located, are most applicable to the

Bikeway. This document also outlines details related to the provision and installation of bicycle parking. Bicycle parking spaces which are required for development subject to Environmental Design Review have additional stipulations that may not apply to bicycle parking installed in relation to the Bikeway. Construction or reconstruction for specific uses on a site abutting the Bikeway will require a special permit granted by the Arlington Redevelopment Board.

New Development & Access

Two private developments adjacent to the Bikeway are in process at the time of writing.

- [1165R Massachusetts Avenue](#): The proposed development is a 124-unit multi-family residential rental project located south of the Bikeway near the intersection of Massachusetts Avenue and Forest Street. The developer received a Comprehensive Permit and the Arlington Zoning Board of Appeals has granted a waiver for the design standards imposed to buildings along the Bikeway.
- [Thorndike Place](#): The proposed development is a 124-unit age-restricted independent living residence and six duplex buildings with 12-units total, together with a preservation of approximately 11 acres of conserved land. The development site is located west of the Bikeway just north of the Cambridge/Arlington line. The Zoning Board of Appeals has approved a Comprehensive Permit application for the proposed development.

Three new access points to the Bikeway are being proposed at the time of writing.

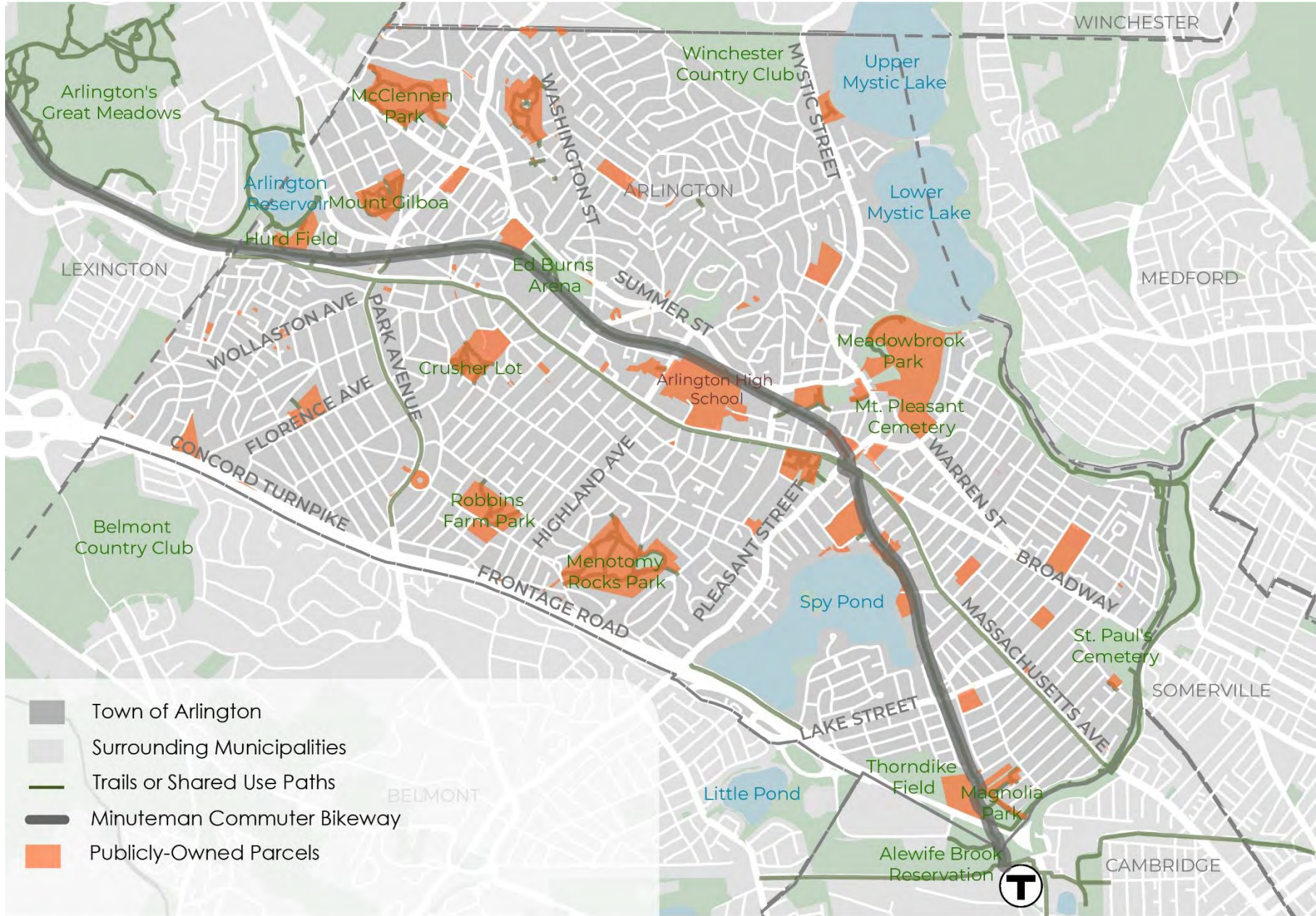
- Arlington Reservoir Connection: The Town of Arlington received grant funding through MassTrails to design and engineer an ADA-compliant pathway connecting the Bikeway to the Arlington Reservoir through Hurd Field. This pathway was one of many recommendations that resulted from the Arlington Reservoir Master Plan, released in 2018.
- Mystic River Path Connection: The Town of Arlington received grant funding through MassTrails to connect the Mystic River path and the Bikeway via the Mystic Valley Parkway along the south side of lower Mystic Lake and along Summer Street in Arlington.
- Arlington High School (AHS) Connection: A pathway connection between the Bikeway and Arlington High School has been designed as part of the reconstruction of AHS. This connection will be completed via a bicycle and pedestrian ramp north of the W. A. Peirce Field and is expected to start construction in 2024.
- 19R Park Avenue Connection: A pathway connection between the 19R Park Avenue affordable housing development and the Bikeway was approved by the Arlington Redevelopment Board and is seeking funding and design approval.

Parcel Ownership

The Bikeway corridor is owned by the MBTA. Adjacent parcels are a mix of private and public land.

Figure 4 illustrates parcels adjacent to the Bikeway that are publicly owned and that may provide opportunities for waysides, path widening, or other integrations of the Bikeway into the adjacent properties.

Figure 4: Publicly-Owned Parcels



Publicly-Owned Parcels



Source: Mass.gov, Arlington MA Open Data

PATH VOLUMES

Volunteers for the Town of Arlington collect manual bicycle and pedestrian counts on the Bikeway annually. These are provided to the Central Transportation Planning Staff (CTPS), which manages a regional bicycle and pedestrian count database.



2600
Average
Daily Path
Users

In addition to these manual counts, continuous (periods of 15 minutes) path user volume data is collected by an automated counter along the Bikeway near Swan Place. This data is available from June 26, 2019, through the present. During the period from July through October 2019 (pre-pandemic), the median number of path users was 2,620, with 56% of path users biking, and 44% walking. During weekends for this period, the Bikeway occasionally had over 4,000 trips. In the same time frame of July through October during 2021 (during the COVID-19 pandemic), the median daily volume of path users decreased to 1,944, or by 26%, with 62% percent of path users biking and 38% walking.¹ This decrease can most likely be attributed to the reduction in commuting trips, which make up a large proportion of trips on the Bikeway. And while the Bikeway has been an essential opportunity for outdoor recreation during the COVID-19 pandemic, crowding may have discouraged some people from frequenting the Bikeway due to social distancing considerations. **Figure 5** and **Figure 6** show the daily path use near Swan Place during these time periods.

¹ Due to hardware malfunctions, the data collected from the counter is sometimes incomplete or missing for periods of several weeks. Days with incomplete count data were removed from the summary.

Figure 5: Daily Path Users, July - October 2019

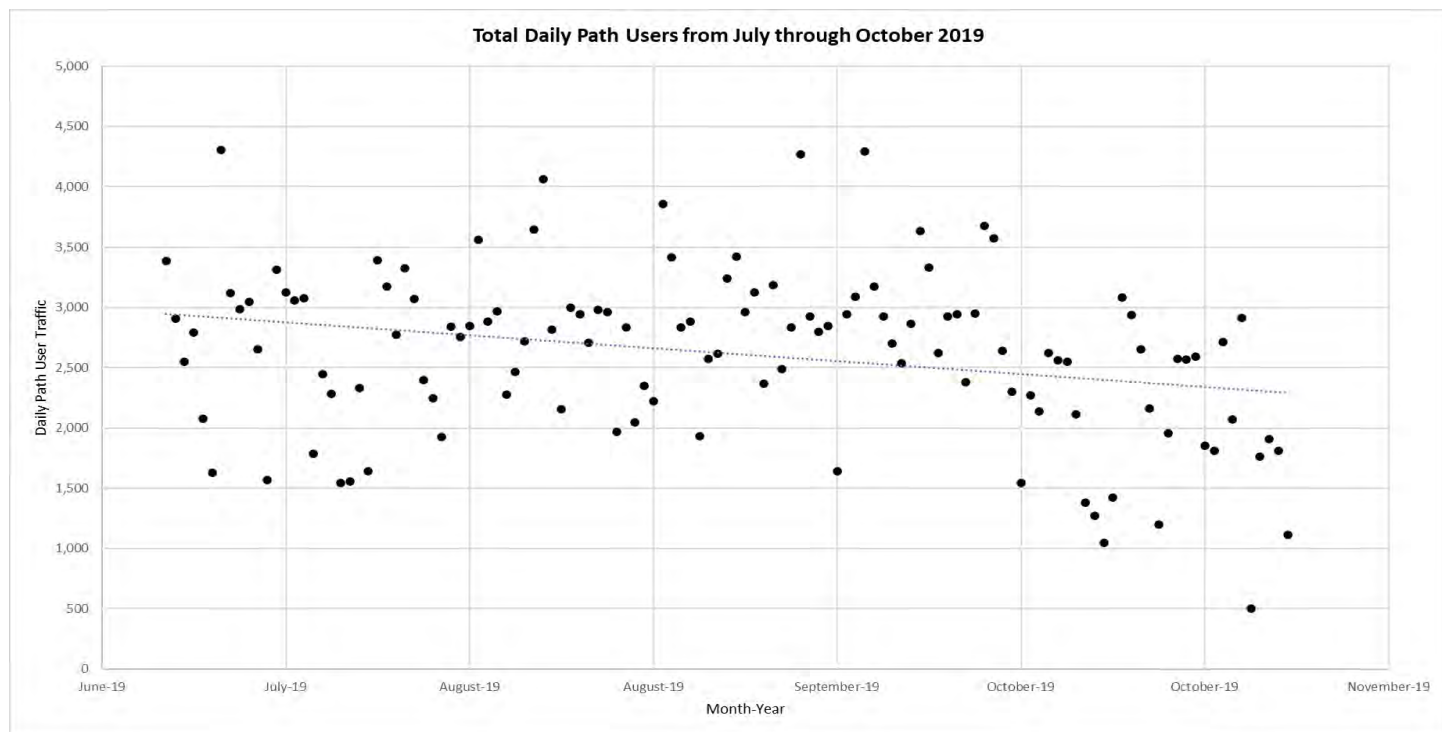
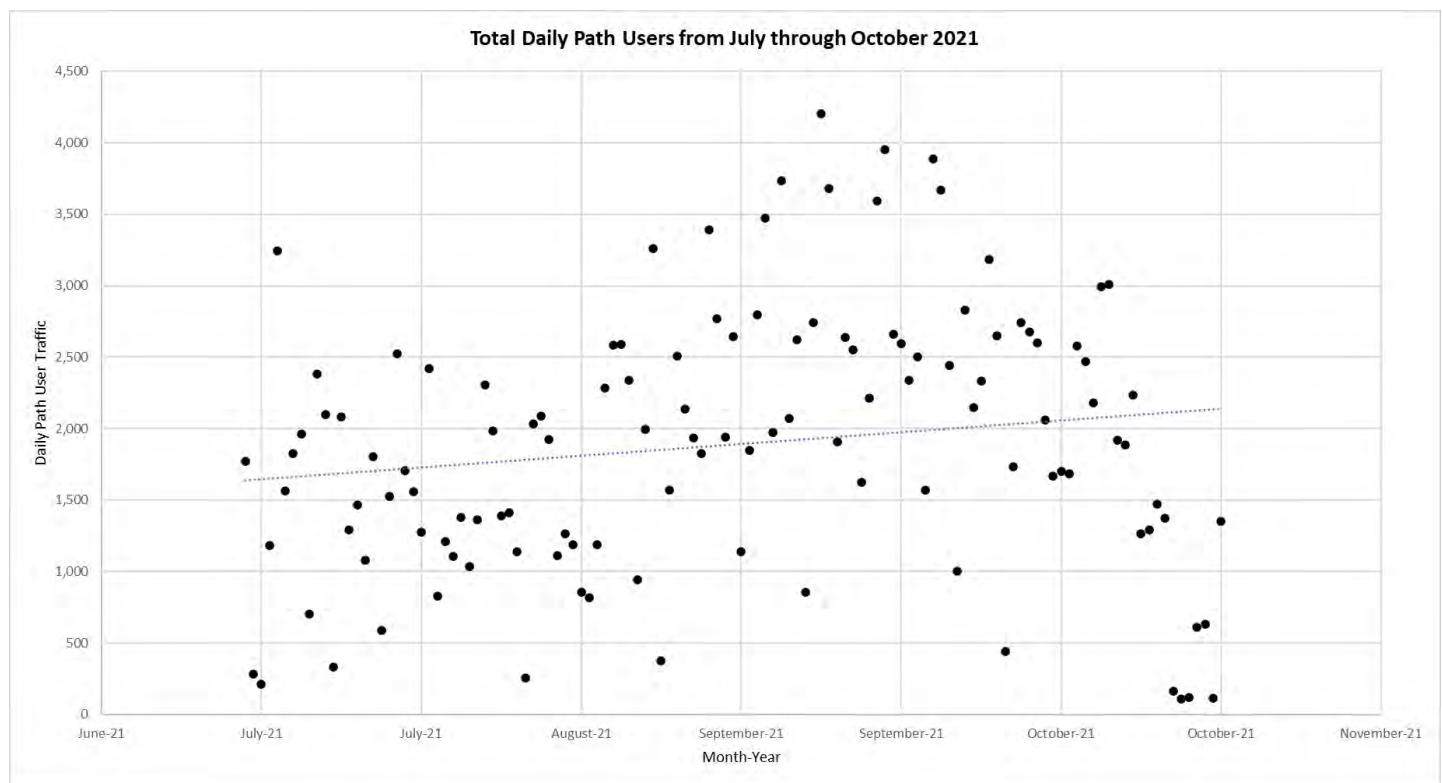


Figure 6: Daily Path Users, July - October 2021



East Arlington Livable Streets (EALS) also conducts annual seasonal counts during the morning peak (7:00am to 9:00am) and evening peak (4:30pm to 6:30pm) hours at Thorndike Dog Park. A summary of these counts is shown below in **Table 1**.

Bicyclist volumes tend to decrease in the winter months while pedestrian volumes are more consistent throughout the year.

Table 1. East Arlington Livable Streets Annual Counts

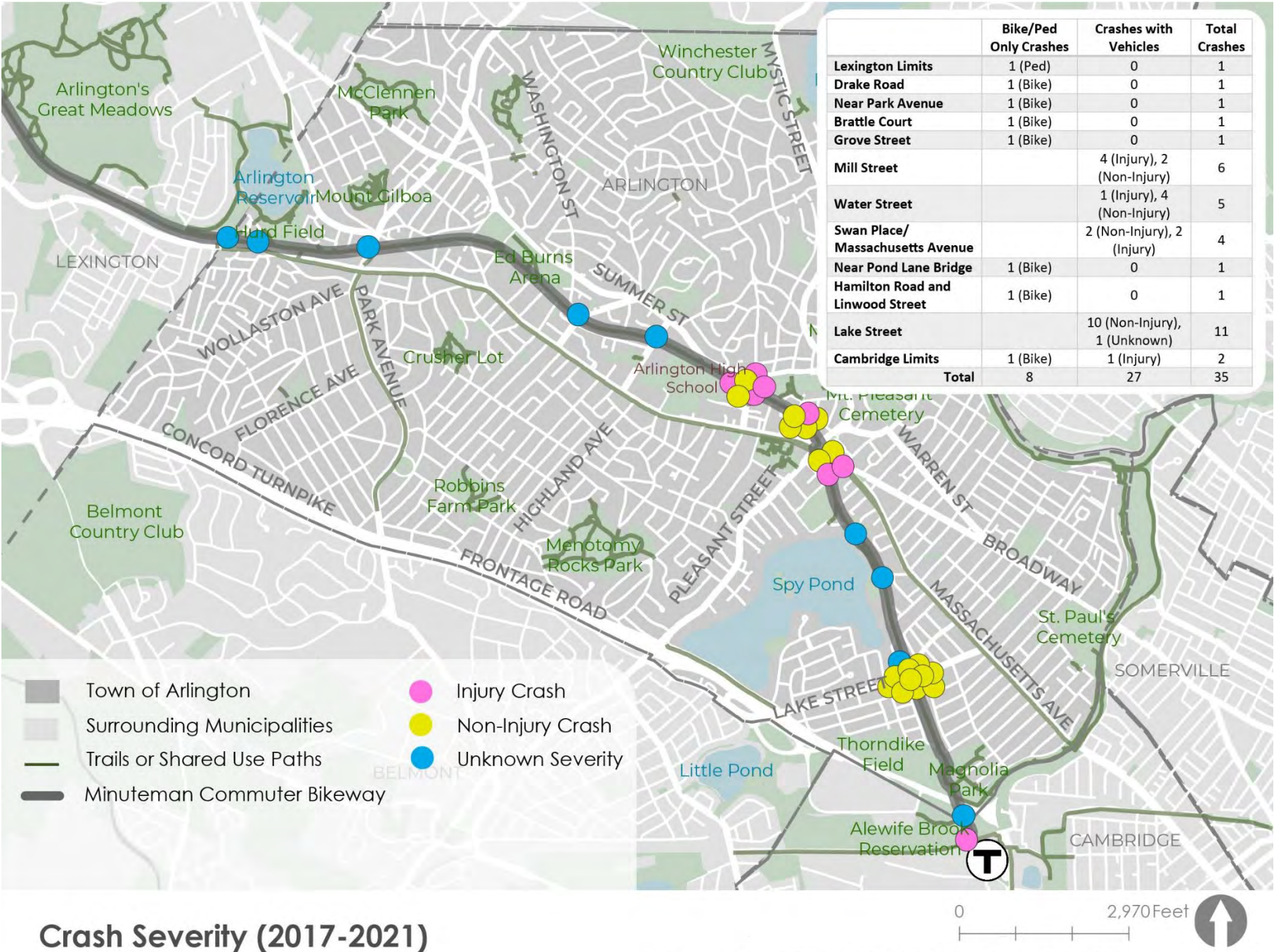
Season	Date	Morning Peak Volumes	Evening Peak Volumes
Winter (pre-pandemic)	Tuesday, January 30, 2018	698	692
Fall (pre-pandemic)	Wednesday, September 18, 2019	1,535	1,359
Fall (post-pandemic)	Tuesday, September 15, 2020	496	854

CRASH HISTORY

The project team reviewed crashes involving non-motorists in the vicinity of the Bikeway for the period between January 2017 and September 2021. The crash reports were collected from both the Massachusetts Department of Transportation and the Arlington Police Department. During this time, 35 crashes involving at least one person walking or biking occurred on the Bikeway or at intersections of the Bikeway and local roads (**Figure 7**). Of these crashes, 27 involved vehicles and eight solely involved path users. Eight crashes resulted in injuries to at least one involved party. The most common crash locations were the intersections of the Bikeway and Lake Street (11), Mill Street (6), Water Street (5), and Massachusetts Avenue (4). A majority of crashes (21) occurred during the afternoon and evening and over three-quarters of the crashes (27) occurred between the months of May and October, when the weather is typically ideal for walking and biking activity. During this same time period, 84 citations were issued at the intersection of the Bikeway and Lake Street – information on whether citations were given to path users or drivers was not included. These citations were often issued in clusters, with several on the same day, so it can be assumed they were likely part of a focused patrol effort preceding the Fall 2020 intersection improvements.

A fatal crash between two bicyclists on the path in Lexington in 2019 is not within the study area but has highlighted the need for safety and travel demand management improvements along the corridor as a whole.

Figure 7: Crashes on Bikeway and at Roadway Crossings



Source: Mass.gov, Arlington MA Open Data, Arlington Police Department, MassDOT

ENTRY AND ACCESS POINTS

There are several official entry and access points to the Bikeway, including the beginning of the path at Alewife Station, the gateways at Swan Place and Mystic Street, and the five intersections between the Bikeway and local streets. There are also a significant number of unimproved paths and connections that have been created over the years because of consistent use or the actions of private property owners and adjacent businesses. Since the rail corridor outside of the Bikeway is under the domain of the MBTA, the addition or alteration of entry and access points requires clear coordination with the MBTA's Real Estate Division.

The project team reviewed the existing entry and access points to the Bikeway in the field and recorded the location, causes of obstruction (if any), sight distance (if obstructed), ADA compliance, and photographs of the access point. A total of 45 entry and access points were identified. These access points are not distributed evenly across the length or between sides of the Bikeway. Notable gaps include those areas where the Bikeway is grade separated from the surrounding roadway network, such as the area near the Grove Street overpass. **Table 2** summarizes the primary issues observed in the field at these access points. Each of these primary issues can pose problems for path users with disabilities and most instances are not compliant with ADA regulations. Relevant photos are referenced in **Table 3** and a summary of observed access point locations are shown in **Figure 8**. A segment-by-segment summary of the access points can be found in **Appendix A**.

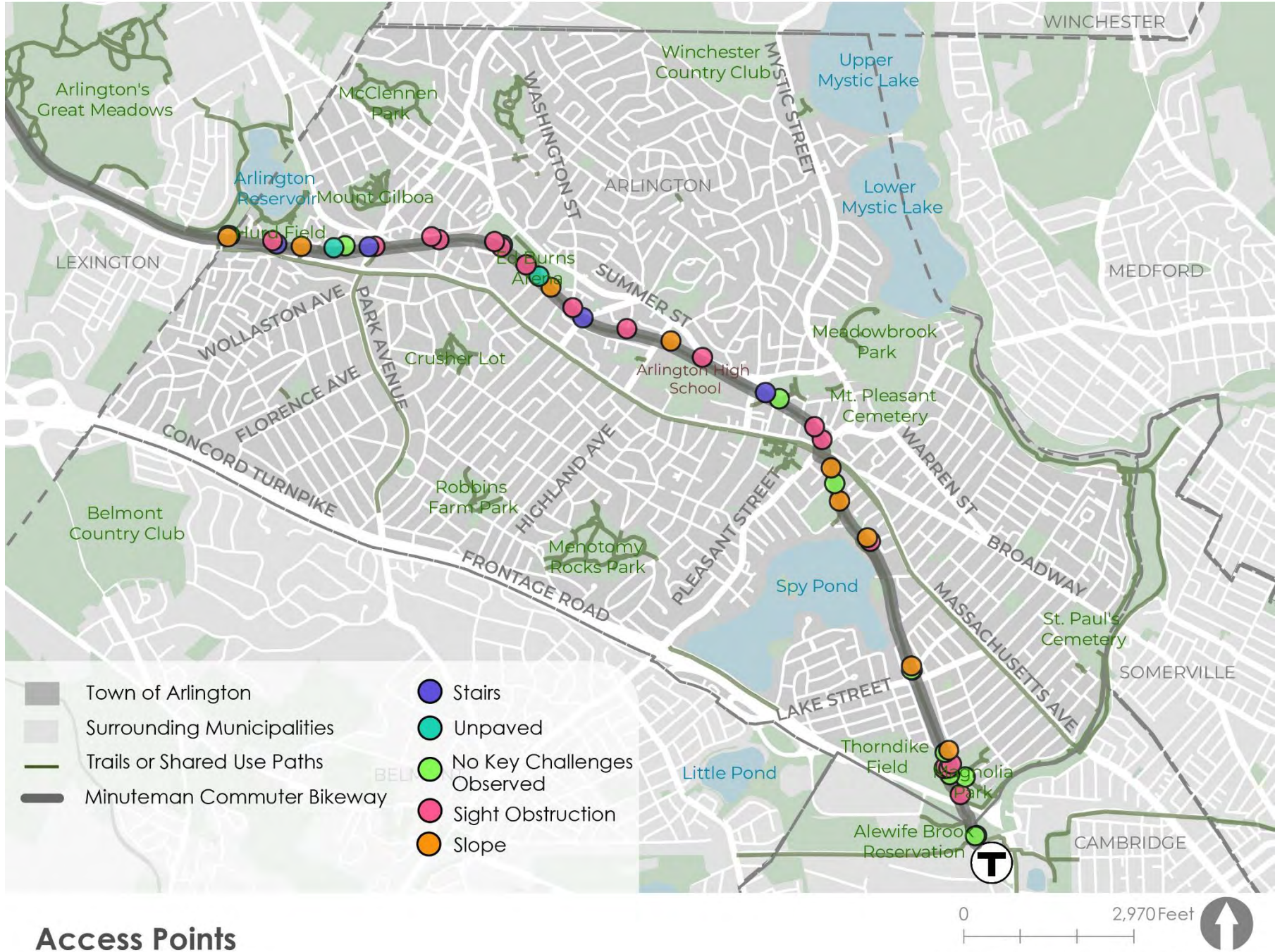
Table 2. Primary Issues with Existing Entry and Access Points

Primary Issue Category	Description	# of Access Points Assigned to Category
Unpaved	Unpaved access points are inaccessible to many path users including wheelchair users and typically are not flush with the Bikeway pavement (i.e., do not meet at the same grade). Improvement requires simple fine grading and paving of a small area (typically less than 100 S.F.). Due to the low cost of the solution and relatively low impact of the issue to most path users, only access points not demonstrating issues in other categories were assigned “unpaved” as their primary issue (1A-1B).	3
Sight obstruction	Sight obstructions at access points along the Bikeway include vegetation, structures, and alignment of the path and access point intersection. Of the 17 points with sight obstruction, 11 involved sight obstruction due to vegetation. Typically, these obstructions require trimming of light vegetation and do not involve tree trunks or large branches (2A). Seven of these access points have obstructed sight lines due to a skewed alignment or nearby curve in the Bikeway (2B).	17
Slope	Access points with a noticeably steep slope that is likely inaccessible to assistive mobility devices and/or bicycles are assigned to the “slope” category. In most cases (6 of 9), access points under this primary issue category are unpaved as well (3A). Additionally, these unpaved points with slope issues are typically dirt with virtually no vegetation in the path due to wear by path users (3B).	9
Stairs	The “stairs” primary issue is assigned to access points with only stairs and no ramp or level alternative. Stairs are entirely inaccessible to wheelchair users and many other people with mobility impairments. Additionally, stairs are inaccessible to many people with bikes. Any locations with stairs are given this designation regardless of the surface material, slope, or sightlines of the connection between the stairs and Bikeway (4A-4B).	5
No Key Challenges Observed	Any access points to which none of the four primary issue categories above are applicable are assigned to the “not applicable” category. These sites are all paved, level, and absent of stairs and sight obstructions (5A-5B).	11

Table 3: Access Point Photos

	1. Unpaved Surface	2. Sight Obstruction	3. Slope	4. Stairs	5. No Key Challenges Observed
A					
B					

Figure 8: Key Challenges at Bikeway Access Points



WAYSIDES AND TRAILHEADS

Waysides and trailheads are locations that serve a mix of utilitarian and recreational purposes in support of the Bikeway. When applied at logical locations - such as path or roadway intersections, vistas and views, locations where users are expected to want to rest, or at regular intervals along the corridor - waysides and trailheads provide amenities and treatments that create a sense of place, orientation, and comfort. While similar in many ways, waysides are defined for the purpose of this study as locations along the side of a shared use path or trail corridor where people can stop to rest, regroup, immerse, or recreate.

Trailheads may serve these same purposes but are located at key multimodal access points where path users transition from other facilities or the street network into the Bikeway. Trailheads should include information such as maps, rules, policies, and path user etiquette expectations to orient people as they enter the facility. They should also include infrastructure that assists in transitioning between networks such as vehicle parking or bike rental stations.

The table below (**Table 4**) provides examples of the types of components that might be found at a wayside, trailhead, or both. Minor access points may be more appropriately categorized as waysides or neither if no amenities or placemaking are provided. **Table 5** summarizes the waysides and trailhead components observed along the trail.

Table 4: Wayside and Trailhead Example Components

Component Purpose	Example Components	Wayside	Trailhead
Access and orient	Informational signs or kiosks with maps, rules, and policies		X
	Vehicular parking		X
	Bike rental stations		X
	Bike repair stations	X	X
Rest, and regroup	Seating	X	X
	Views and vistas	X	
	Landscaping and plantings	X	X
	Pull offs for pausing out of the way of path traffic	X	
	Trash receptacles	X	X
	Bike parking	X	X
Immerse	Public art	X	X
	Cultural, historical, or educational exhibits	X	X
	Natural areas	X	X
Recreate	Multi-use fields	X	X
	Sports and exercise equipment	X	X
	Playgrounds	X	X
	Secondary paths	X	

Table 5: Existing Waysides and Trailheads

Location	Features	Observations	Points of Interaction	Points of Access	
			Wayside	Trailhead	Minor Access
Lexington border	Benches	De-facto trailhead to Arlington. Major access point to Bikeway.		X	
Hurd Field	Parking, soccer fields, baseball fields, habitat garden, walking paths	Seasonal restrooms, connection to Arlington Reservoir. Major access point to Bikeway.		X	
Trader Joe's	Bike rack		X		
Walgreens	Bench		X		
Park Avenue	Stairway with bike rail	Grade Separated, Lack of maintenance.			X
Summer Street Sports Complex	Lighted baseball fields (Robillard and Buck Field), multi-purpose fields, basketball court, playground, benches, bike racks, bocce courts, picnic area	Direct connection off path. Seasonal restrooms at fields.		X	
Ryder Street	Parking	At-grade crossing. Ryder Street dead ends either side of path. Major access point to Bikeway.		X	
Burns Arena	Ice rink, bathrooms, snack bar, vending machines, parking.	Restrooms and food.		X	
Hill's Hill	Secondary trails	Minimal improvements.	X		
Brattle Street	Stairway, paved path to Washington St.				X
Mill Street		At-grade crossing. No improvements.			X
Buzzell Field Park	Two baseball fields (1 lighted), playground, basketball court.	Direct connection off path.		X	
Water Street		At-grade crossing. No improvements.			X

Uncle Sam Plaza	Benches, bike parking, historical info, landscaping, overhead banner sign	Direct connection off path. Overhead sign at Mystic Ave still relates to old alignment.		X	
Whittemore Park	Benches, bike racks, cultural heritage site and landscape design	Direct connection off Massachusetts Avenue WB bike lane.	X		
Swan Place	Overhead Banner Sign, bike rack, tire pump	Limited space.		X	
Spy Pond Park	Spy Pond field, playground, shore path, benches, tables, vehicle and bicycle parking.	Poor access or visual connection from path.		X	
Linwood Street	Blue Bike Station, kiosk, vehicle parking.			X	
Scannell Field	Portable toilets, baseball diamond.	Direct connection off path. Seasonal restrooms.	X		
Lake Street	Benches, bike rack, Little Free Library			X	
Varnum Street		At-grade crossing. No improvements			X
Thorndike Field/Magnolia Field (Parking Lot area)	Multi-use fields, vehicle parking lot, bike parking, benches, Blue Bike Station, community garden.	Direct connection off path.		X	
Thorndike Street	Bike repair station.	At-grade connection.			X
Thorndike Dog Park	dog park, benches, kiosk		X		

LIGHTING

Lighting along the Bikeway is generally sparse. Notable lighting along or adjacent to the Bikeway is found at the following locations in **Table 6**. Relevant photos are referenced in **Table 7**. Existing lighting density is illustrated in **Figure 9**, which shows lighting density along the path from sparse to densely lit areas. Minimally lighted segments are large stretches of the path where no adjacent lighting was observed or adjacent lighting may be present but illuminance (amount of light striking a surface, such as pavement) is minimized by vegetation, topography and other trailside features.

Table 6: Existing Lighting Locations

Location	Type	Observations
Alewife Station Access Road	Cobra head (2A)	Street lighting - Pole mounted (aluminum), running parallel to trail (far side of street)
Route 2 Underpass	Area light (5A)	Under lights - mounted to bridge beams
Route 2 to Thorndike Park	Cobra head (1A)	Path lighting - pole mounted (aluminum)
Thorndike Dog Park	Decorative acorn (3A)	Park lighting - pole mounted (steel), pedestrian height
Thorndike Street	Cobra head (2A)	Street lighting - pole mounted (utility pole)
Thorndike Park Parking Area	LED shoebox (2B)	Parking lights - pole mounted (utility pole)
Lake Street	LED shoebox (2A)	Street lighting - pole mounted (utility pole)
Hamilton Road	Cobra head (1B)	Street lighting - pole mounted (utility pole), running parallel to trail (near side of street)
Linwood Street	LED shoebox (2A)	Street lighting - pole mounted (utility pole)
Pond Lane	LED shoebox (2A)	Street lighting - pole mounted (conc. pole)
Whittemore Street	LED shoebox (2A)	Street lighting - pole mounted (utility pole)
Swan Place	Shoebox	Street lighting - pole mounted (utility pole)
Mystic Avenue & Mass Avenue	LED shoebox (2A), Decorative acorn (3B), building lights	Street lighting - pole mounted (aluminum), Sidewalk lighting - pole mounted
Uncle Sam Plaza	Decorative acorn (3C)	Plaza lighting - pole mounted (steel), pedestrian height, running parallel to trail
5/11 Water Street	Decorative acorn (3D)	Parking lighting - pole mounted (steel), pedestrian height, running parallel to trail
Water Street	LED shoebox (2A)	Street lighting - pole mounted (utility pole)
Mill Street	LED shoebox (2A)	Street lighting - pole mounted (utility pole)
Summer Street	LED shoebox (2A)	Street lighting - pole mounted (utility pole), running parallel to trail (near side of street)
Peirce Field	High Mast (4A)	Adjacent athletic field lighting
Grove Street	LED shoebox (2A)	Street lighting - pole mounted (utility pole)
Hill's Hill	High Mast (4A)	Adjacent athletic field lighting
Ryder Street	Cobra head (2A)	Street lighting - pole mounted (utility pole)
Summer Street Park	High Mast (4A)	Adjacent athletic field lighting
Forest Street	LED shoebox (2A)	Street lighting - pole mounted (utility pole)

Table 7: Trailhead Photos





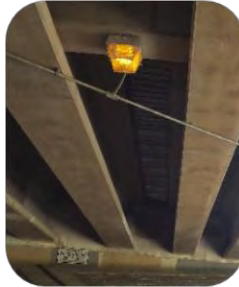





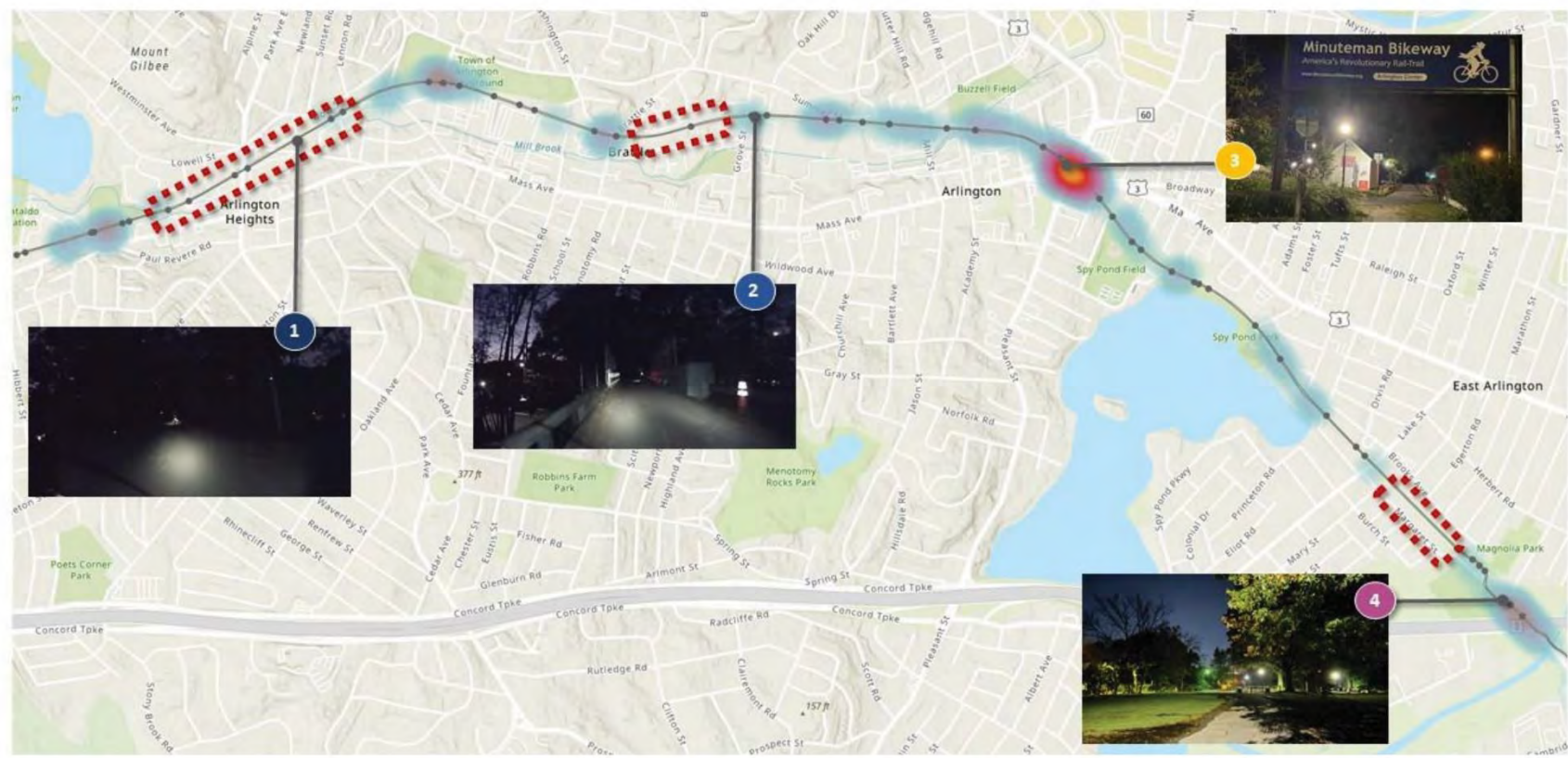
	1.Path Lighting	2. Street Lighting	3. Decorative	4.High Mast	5. Area Light
A					
B					
C					
D					

Figure 9: Existing Lighting Density



- Trail Access Point (Both Improved and Unimproved)
- ▤ Minimally Lighted Segment
- Sparse Lighting Dense Lighting



Existing Lighting Density (October 2021)
Minuteman Bikeway Planning Project

Source: Mass.gov, Arlington MA Open Data

SIGNAGE

Table 8 summarizes the types of signs along the Bikeway, their typical application, and the consistency of use. Relevant photos are referenced in **Table 9**. In general, there are several different sign types used on the Bikeway, ranging from regulatory and warning signs to wayfinding and path use guidance signs. The application of signs is not consistent along the Bikeway or at entry points. All signage on the Bikeway should comply with town zoning bylaws and is under the purview of the Arlington Redevelopment board.

Table 8. Types of Signs on the Bikeway

Type of Sign	Typical Application & Consistency
Informational	Informational signs and exhibits are positioned along the Bikeway at points of interest to provide context and historical information to path users. These include bulletin boards (1A), on which people can post announcements and other information, exhibits in areas with historical or environmental significance (1B), such as those at Spy Pond and Arlington Center, and recognition plaques (1C), which recognize the Bikeway as a member of the Rail-Trail Hall of Fame at limited locations along the route.
Gateway	Gateway signs typically mark the entrance to a roadway or path. The Bikeway features two large gateway signs on either side of the Massachusetts Avenue and Mystic Street intersection (2A). The sign on Mystic Street is no longer oriented across the Bikeway because the path was relocated as part of the Safe Travel Project. A gateway sign also welcomes path users to Arlington and the Donald R. Marquis section of the Minuteman at the Lexington/Arlington town line (2B).
Wayfinding	Wayfinding signs help direct path users to points of interest, historic sites, and nearby streets. These signs can also help direct people walking and biking on intersecting streets to the Bikeway. These include official guide signs, such as "Bike Route" signs placed in view of drivers at most major intersections (3A), as well as more informal signs orienting path users to streets and destinations in their vicinity (3B-3D). Street signs are relatively consistent along the Bikeway but other informal wayfinding signs are not consistent in their frequency, installation, or branding.
Regulatory	Regulatory signs are used to indicate or reinforce traffic laws, regulations, or requirements. Along the Bikeway, these include stop signs (4A), requiring path users to stop before proceeding across intersections; yield signs (4B), positioned at locations where two paths converge; and "No Motor Vehicles" signs (4C), typically installed in view of drivers at intersections. Stop signs are consistently installed at locations where the Bikeway intersects with a street. The use of yield signs and "No Motor Vehicles" signs at access points and intersections is sporadic.
Warning	Warning signs call attention to unexpected conditions or alert users to conditions that might require a reduction of speed. Along the Bikeway, these include signs alerting path users to a traffic signal or stop sign ahead (5A-5B), typically placed in advance of an intersection, and signs highlighting the presence of pedestrians (5C), typically placed in areas with high walking traffic, such as the access point for Trader Joe's supermarket. The use of warning signs is not consistent, likely due to the fact that intersection control varies along the Arlington section of the Bikeway.
Path Use	Various signs provide guidance to path users on the proper behavior and expected use on the Bikeway. These are often installed at prominent access points, following major intersections, or where the path design requires additional user guidance, such as at the Lake Street intersection. These signs typically provide a preferred use or code of conduct (6A-6C), with the exception of one sign, which references a Town of Arlington statute that prohibits riding bicycles on the sidewalk (6D). While these signs are generally consistent in their messaging, they vary in their design, placement, and frequency. Depending on where a user accesses the Bikeway, they may never encounter a path use sign.

Table 9: Existing Sign Types

	1. Informational	2. Gateway	3. Wayfinding	4. Regulatory	5. Warning	6. Path Use
A						
B						
C						
D						

ARTWORK

Pathways: Art on the Minuteman was launched in 2017. The Arlington Commission for Arts and Culture commissions art displays along the trail with approval from the Town Manager (see below hyperlink for additional details). There are currently four displays between Linwood Street and Swan Place. The displays at these locations and additional displays near Park Avenue/Bow Street/Ryder Street and Summer Street Park are summarized in **Table 10** and **Table 11** respectively and relevant photos are referenced in **Table 12**. The locations of existing art installations along the Bikeway are shown in **Figure 10**. Over the years, there have been other unsanctioned “guerilla” installations along the Bikeway, which are typically removed by the Town.

Table 10: Arlington Commission for Arts and Culture Displays

Location	Exhibit Name	Type	Observations
South of Linwood Street	Dots and Dashes (1A)	Brightly colored discs	Spaced along the embankment across the path from Hamilton Road.
Linwood Street to Swan Place	Persistence (1B)	Crocheted plastic yarn sculptures	Cabled to trees throughout the tree canopies. Geared toward raising awareness about plastics in the environment.
Pond Lane	ExtraOrdinary Birds (1C)	Painted portraits of birds	Postcards hung in plastic sleeves on the bridge screen.
Linwood Street	Colony II and Colony III (1D)	Wood and paint	Detailed “village” of bird houses.

<http://artsarlington.org/programs/pathways-art-on-the-minuteman-bikeway/>

Other artworks observed along the project corridor includes the following.

Table 11: Additional Art Displays

Location	Exhibit Name	Type	Observations
Park Ave/ Bow Street/Ryder Street	Unknown (2A)(2B)(2C)(2D)	Image transfer on steel sign	Approx. ½ dozen small 12"x12" ocean images on aluminum signs. Not particularly obvious mixed with other signs.
Summer Street Park	Go Out Doors-Arlington (3A)	Painted door	Promotion for healthy outdoor activity. Refer to the below hyperlink for more information.

Table 12: Existing Art Displays










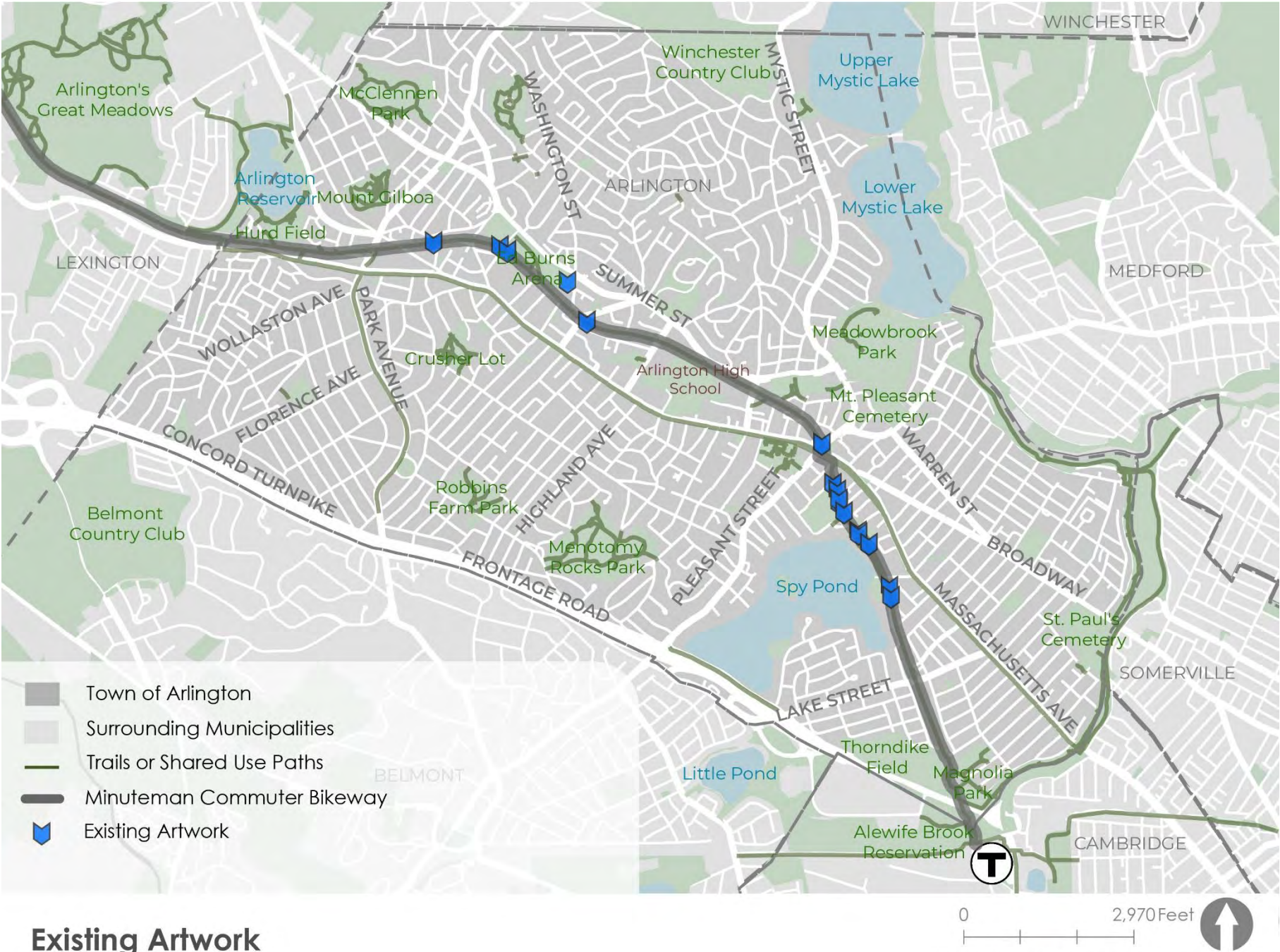
	1. Art along the Pathway	2. Unknown	3. Go Out Doors
A			
B			
C			
D			

Figure 10: Artwork Locations Along the Bikeway



INTERSECTIONS

The Bikeway intersects five streets as it runs through the Town of Arlington. These intersections vary in their traffic control, the typical vehicle volumes, and ease of crossing. **Table 13** summarizes the existing conditions, observations, and issues at each intersection. Relevant photos are referenced in **Table 14**.

Table 13. Intersection Existing Conditions, Observations, and Issues

Intersection	Existing Conditions	Observations	Issues
Lake Street	<ul style="list-style-type: none"> • Pedestrian and bicycle signals control crossing for path users (1A) • On each approach, the Bikeway widens to include sidewalks and a splitter island (1B), directing people walking to the outer edge of the path to either turn from the Bikeway onto Lake Street or to cross at the crosswalk. People biking are directed to continue riding straight across Lake Street along a bicycle crossing marked with green pavement • When a sensor detects people biking toward the intersection, a sign lights up with the message "WAIT FOR GREEN" (1C) • Pedestrian signals direct people walking on Lake Street to stop and wait while people are biking and walking across Lake Street (1D) • Lake Street is a minor arterial with a school zone speed limit of 20 mph. Trucks are excluded. 	<ul style="list-style-type: none"> • Path users generally follow the signal when crossing Lake Street • People walking do not always shift to the widened sidewalk area as intended • The bicycle detection system is accurate in detecting people waiting to cross Lake Street 	<ul style="list-style-type: none"> • Drivers are known to mistake the Bikeway for a vehicular roadway and turn onto it <ul style="list-style-type: none"> ◦ This may be due to the large, vehicle-scale infrastructure at this crossing • People walking along Lake Street tend to miss or ignore the pedestrian signals for the Bikeway crossing • Detectable warnings are installed both at the entrances to the roadway crossing and the Bikeway crossing, which may lead to confusion for visually impaired path users
Linwood Street	<ul style="list-style-type: none"> • Path is stop-controlled in both directions with stop sign and stop line (2A) • Faded "STOP" pavement markings precede the stop lines on the path (2B) 	<ul style="list-style-type: none"> • Path users do not stop at stop line and sign before crossing, but many slow their speed as they approach the intersection • Low visibility between path users traveling from the east and vehicles on Linwood Street 	<ul style="list-style-type: none"> • No advance warning sign or pavement markings for westbound drivers and no instruction to yield for drivers in both directions • Use of stop sign at low vehicle-volume crossing encourages noncompliance by path users

	<ul style="list-style-type: none"> • Solid yellow center line is on Bikeway on both approaches to crossing • Faded pavement markings on Linwood Street read "SLOW" with a bicyclist symbol • Detectable surfaces on the eastern side of the intersection where the sidewalk crosses the Bikeway • Bluebikes station behind sidewalk west of crossing (2C) • Linwood Street is a local street 		<ul style="list-style-type: none"> • No detectable warning at either ramp to cross Linwood Street (2D) <ul style="list-style-type: none"> ◦ Crossing is inaccessible to blind pedestrians
Swan Place/Massachusetts Avenue/Mystic Street	<ul style="list-style-type: none"> • Stop sign and stop line controls at approach to Swan Place • Bicycle signal directs people biking north on Massachusetts Avenue across Mystic Street. • Pedestrian signal and a two-stage left-turn box directs people biking eastbound on the Bikeway across Massachusetts Avenue and toward the Swan Place connection (3A). • Sharrows and a "[BIKE] MAY USE FULL LANE" regulatory sign on Swan Place define connection toward Massachusetts Avenue (3B) • Traditional, unprotected bike lanes provide connection to the Bikeway along Massachusetts Avenue in both directions <ul style="list-style-type: none"> ◦ Bicycling crossing markings guide people biking through the intersection (3C) • "BIKE ROUTE" guide signs are installed between Mystic Street and Swan Place to direct path users • Solid yellow center line is on bikeway on both approaches 	<ul style="list-style-type: none"> • High vehicle speeds and volumes are consistent at Massachusetts Avenue & Mystic Street <ul style="list-style-type: none"> ◦ Road noise is quite loud • During many signal cycles, southbound cyclists often do not fit in the two-stage left-turn box and spill into the intersection or travel lane • Northbound bicyclists often cross Mystic Street in crosswalk instead of in bicycle crossing to avoid riding on left side of ramp near signal pole pinch point (3D) • Pedestrians and cyclists come into conflict at the northern corner of Massachusetts Avenue and Mystic Street as the Bikeway transitions into the sidewalk and cyclists must navigate the crossing • Southbound cyclists sometimes travel in northbound crossbike and bike lane or ride on the sidewalk instead of crossing Massachusetts Avenue and using two-stage left-turn box. Sometimes this is done to continue from heading westbound on Minuteman to northbound on Mystic Street 	<ul style="list-style-type: none"> • Wayfinding for path users is ineffective, despite many signs <ul style="list-style-type: none"> ◦ "BIKE ROUTE" signs are quite small and far from cyclist and pedestrian facilities along Massachusetts Avenue • The northbound bicycle crossing across Mystic Street leads to a traffic signal pole and transition curb piece with partial curb face reveal (3D) • Pavement markings separate northbound bicycle and pedestrian crossings, but users must negotiate a mixing zone on the north side of the crossing • Bikeway connection does not offer sufficient comfort and safety for bicyclists who must travel in parking-adjacent and curbside unprotected bike lanes • Insufficient space for cyclists and pedestrians to queue and for pedestrians to pass the queue on sidewalk • Orientation of "[BIKE] MAY USE FULL LANE" on signal pole at

	<ul style="list-style-type: none"> Swan Place is a local street Massachusetts Avenue and Mystic Street are principal arterials 	<ul style="list-style-type: none"> Northbound vehicles regularly make an illegal right on red 	<p>northern corner of Massachusetts Avenue and Mystic Street and lack of clear wayfinding may contribute to confusion and people riding southbound in northbound bike lane</p>
Water Street	<ul style="list-style-type: none"> Path is stop-controlled in both directions with stop sign and stop line Faded "STOP" pavement markings precede the stop lines on the path (4A) Hybrid W11-1/W11-2 sign and "TRAIL X-ING" plaque are posted for northbound and southbound drivers approaching crossing (4B) Solid yellow center line is on bikeway on both path approaches to crossing "BIKE ROUTE" guide sign and two-way arrow plaque are posted for both Water Street approaches to crossing Water Street is a local street "NO MOTOR VEHICLES" regulatory signs are posted at each path ramp facing the roadway (4B) Reflective yellow strip is installed on east-side sign post to delineate between parking lot entrance (Russel Terrace) and path (4C) Crosswalk paint is slightly faded (4D) 	<ul style="list-style-type: none"> Path users regularly approach and cross without stopping at stop line and/or stop sign During the AM peak period, vehicles traveling southbound on Mystic Street use Russel Street and private alley to bypass Mystic Street/Massachusetts Avenue intersection² Challenging sightlines for vehicles turning onto Water Street from private alley as well as on Bikeway 	<ul style="list-style-type: none"> No detectable warning for path users crossing Water Street or the Bikeway (4A) Use of stop sign at low vehicle-volume crossing encourages noncompliance by path users
Mill Street	<ul style="list-style-type: none"> Path is stop-controlled in both directions with stop sign, stop line, and flashing red beacon (5A) 	<ul style="list-style-type: none"> Path users do not comply with stop control when drivers are not present on Mill St 	<ul style="list-style-type: none"> "YIELD HERE TO [PEDESTRIAN]" sign is not supplemented with yield line on pavement (5B)

² Arlington Transportation Advisory Committee *Water Street/Minuteman Bikeway Intersection Recommendations*, 2018.

	<ul style="list-style-type: none"> ○ RRFBs and “YIELD HERE TO [PEDESTRIAN]” regulatory signs alert drivers on Mill Street to crossing path users and direct them to yield (5B) ○ RRFBs and flashing red beacons are passively activated • Faded “STOP” pavement markings precede the stop lines on the path (5C) • Solid yellow center line is on Bikeway on both path approaches to crossing • Detectable warning panels are present for both path ramps (Photo 5C) • Mill Street is a minor arterial 	<ul style="list-style-type: none"> • Passive activation of RRFBs generally detects path users reliably but continued maintenance is needed • Southbound vehicles queuing for flashing beacon spill back onto Summer Street 	<ul style="list-style-type: none"> • Priority and right-of-way is ambiguous at this crossing due to combination of stop control for path users and yield control for drivers on Mill Street • Motion sensors detect path users only when they are in close proximity to the crossing and could be added and/or angled to detect path users earlier
--	--	--	--

Table 14: Target Intersections

	1. Lake Street	2. Linwood Street	3. Massachusetts Avenue	4. Water Street	5. Mill Street
A					
B					
C					
D					

MAINTENANCE PRACTICES

According to the License Agreement between the Town of Arlington and the MBTA, the Town is responsible for maintaining the Bikeway in good and safe condition and appearance and free from rubbish and obstructions. The MBTA has no responsibility for maintenance repair or the condition of the Bikeway. The Town is also required to provide security and fire protection along the Bikeway. While the MBTA is responsible for maintaining the structural integrity of any overpasses or bridges which they maintained prior to the agreement with the Town, it is the Town's responsibility to maintain the surfaces of these structures, including general cleanliness, appearance, alterations required for use as part of the Bikeway.

While there is no formal maintenance policy or program for the Bikeway, the Town Manager oversees the maintenance of the Bikeway and approves changes on the property. Tasks such as mowing, patching asphalt, and vegetation pruning are carried out by the Department of Public Works on an as-needed basis. The Bikeway is maintained and plowed similarly to roadways in the town.

Changes to the Bikeway beyond the existing path layout must be approved by the MBTA Real Estate Division. Furthermore, changes to the Bikeway at crossings affecting the public right-of-way must be approved by the Arlington Select Board. The following entities and stakeholders are frequently or occasionally involved in issues related to the Bikeway:

- Town Manager
- Arlington Bicycle Advisory Committee (ABAC)
- Transportation Advisory Committee (TAC)
- Arlington Select Board
- Tree Committee
- Open Space Committee
- Parks and Recreation Commission
- Community Preservation Act Committee
- Capital Planning Committee
- Arlington Commission for Arts and Culture (ACAC)
- MBTA Real Estate Division
- Department of Public Works (DPW)
- Conservation Commission
- Arlington Recreation

Maintenance challenges along the corridor can broadly be categorized as issues related to the bikeway surface, vegetation, drainage, and bridge decks. **Table 15** lists observations from the field and considerations. Existing conditions related to drainage and bridges are described in more detail in the following sections.

Table 15: Maintenance Field Observations

Category	Observations	Considerations
Bikeway Surface	Uneven asphalt path surface due to heaves (root or otherwise).	Uneven surfaces become more hazardous at night when lighting is limited.
	Asphalt patching creates a bumpy surface.	
	Transitions between surface materials have become hazards such as at the bridge across Alewife Brook and the Arlington/Cambridge Line granite pavers.	Uneven transitions can have safety and ADA implications.
Vegetation	Vegetation crowding sight lines at access points and narrowing effective width of path along corridor.	Property beyond Bikeway is maintained by the MBTA.
	Invasive plants including Japanese Knotweed, garlic mustard, and black swallowwort.	
	Falling branches during severe weather events.	
Bridge Deck	Most bridges along the Bikeway are level, former rail overpasses or water crossings. For these structures, the Bikeway's asphalt surface continues uninterrupted.	
	The bridge across Alewife Brook has a prefabricated wood surface. The surface deck and railing are decaying. At either entrance to the bridge, the bases for former bollards present a hazard – the bases are often covered with traffic cones.	MBTA is responsible for all structural maintenance of bridges they previously maintained.
		The decaying wood surface creates a slippery surface when wet.
Drainage	Standing water was observed in some locations adjacent to the Bikeway, such as under the Lowell Street Bridge and near the Thorndike Dog Park. Near the Thorndike Dog Park, country drainage effectiveness is inhibited by knotweed.	Standing water along the edges of the Bikeway limits the ability of path users to use the shoulders.
	Standing water sheeting on the Bikeway has been observed at locations such as adjacent to Thorndike Field and between Lake Street and Linwood Street.	During winter months, water sheeting across the Bikeway presents an ice hazard.

Other areas for regular maintenance include leaf litter and debris removal, snow plowing, edge mowing, amenities upkeep, sign replacement, and trash removal.

BRIDGES

The Minuteman Bikeway crosses over seven bridges within the project limits (**Table 16**).

Table 16: Bikeway Bridge Crossings

Location	Clear Width/Type	Issues	Observations
Whittemore St. (1A)	12'/Concrete	No shoulder space	Width restricted by deck construction. Abutment is wider than superstructure.
Pond Lane (1B)	12'/Concrete	No shoulder space	Width restricted by deck construction. Abutment is wider than superstructure.
Forest Street (2A)	10'/Steel & Concrete	No shoulder space	Width restricted by thru-girder configuration of old rail bridge. Abutment is wider than superstructure.
Brattle Street (2B)	12'/Steel & Concrete	No shoulder space	Width restricted by configuration of old rail bridge. Abutment is wider than superstructure.
Grove Street (2C)	10'/Steel & Concrete	No shoulder space	Width restricted by thru-girder configuration of old rail bridge. Abutment is wider than superstructure.
Alewife Brook (3A)	10'/Prefab wood	Deck and rail decay, no shoulder space	Width restricted by bridge configuration. See Bridge Assessment in Appendix B and prefabricated standard specifications in Appendix C .
Mill Brook (4A)	12'/Concrete	No shoulder space	Crosses over Mill Brook

The Minuteman Bikeway passes under three roadway bridges (**Table 17**). Relevant photos of both types of bridge crossings are referenced in **Table 18**.

Table 17: Bikeway Underpasses

Location	Clear Width/Type	Issues	Observations
Drake Road (5A)	24' / Concrete	None Observed	
Park Avenue (5B)	27' / Concrete	None Observed	Stream passes thru box culvert built into bridge abutment.
Lowell Street (5C)	13'-2" / Concrete	Undermining of path edge	Path shares underpass with an adjacent stream.

Table 18: Bridge and Underpass Crossings

	1.Path over Road - Concrete Deck	2. Path over Road - Concrete & Steel	3. Path over Water – Timber	4.Path over Water – Concrete Deck	5. Path under Road
A					
B					
C					

DRAINAGE

Formal drainage along the Bikeway is limited and a variety of treatment approaches are used. **Table 19** summarizes the typical drainage treatments used along the Bikeway. Relevant photos of drainage are referenced in **Table 20**.

Table 19: Typical Drainage Applications

Type of Feature	Typical Application & Consistency
Country Drainage	A majority of the trail has no curbs or any closed drainage systems (1A)(1B)(1C). Water sheds off the trail and disperses into the surrounding landscape. Country drainage is considered a low impact form of stormwater management.
Swales	A prominent swale is located on the eastern side of the trail from Nourse Street to the proximity of Bow Street/Mill Lane where it goes underground towards the Mill Brook (2A) (2B) (2C). The path shares space with this watercourse at the Lowell Street underpass.
Cross Culverts	The original design plans show approximately five cross culverts: <ul style="list-style-type: none"> • Between Park Ave and Lowell St. - behind 30 Park Ave. (3A) • Near Forest St. (3B) • Between Ryder and Brattle St. (3C) • Between Brattle Pl and Grove St. (3D)
Stone Box Culvert	There is a granite box culvert built into the base of the eastern abutment at Park Avenue. (4A)
Catch Basins	A handful of catch basins were observed along the trail, including north of Lake Street and at the Park Avenue underpass. (5A) (5B)
Waterways	The path crosses the Alewife Brook and twice crosses the Mill Brook (6A)(6C)(6D). A small tributary that passes beneath the Lowell Street bridge goes underground at a headwall near Bow Street. (6B)

Table 20: Drainage Field Observations

	1. Country Drainage	2. Swales	3. Cross Culverts	4. Stone Box Culvert	5. Catch Basins	6. Waterways
A						
B						
C						
D						

WIDTH AND ENGINEERING CONSTRAINTS FOR WIDENING

Due to the high path volumes observed on the Bikeway, the project team assessed the feasibility of widening the Bikeway to accommodate the high usership, to increase space for passing, and to provide room for slower users to travel or rest. Based on the Shared-Use Path Level of Service Calculator, published by the Federal Highway Administration, the Bikeway would require an additional six feet of width to improve the level of service from B to A³. However, adding any increment of width would still be valuable to trail users, even if only provided on select, strategic segments.

The feasibility of widening depends on several factors. Primarily, as mentioned previously, the ability to widen within the MBTA right of way depends on coordination with and approval by the MBTA. Feasibility is also dependent on existing barriers, such as grade-separated crossings like bridges or underpasses, water features, adjacent property lines, and grading. Depending on the unique characteristics of these barriers, they may be more or less of an obstruction to widening. For example, if the existing paved Bikeway is constrained by adjacent property that belongs to the Town, widening in that direction may be feasible. A summary of the main types of barriers is provided in **Table 21**. Relevant photos are referenced in **Table 22**. The locations of barriers to widening are shown in **Figure 11**. A segment-by-segment summary of the barriers and locations can be found in **Appendix A**.

³ Table 12. Shared-use path level of service look-up table, typical mode split
(<https://www.fhwa.dot.gov/publications/research/safety/pedbike/05138/05138.pdf>)

Table 21. Types of Barriers to Widening

Types of Barriers	General Locations and Considerations
Grade-Separated Crossings	The Bikeway traverses six bridges and four underpasses as it passes through Arlington. These structures place constraints on the width of the Bikeway and already serve as significant pinch points today (1A-1C). The MBTA is responsible for maintaining the structural integrity of these overpasses and bridges while the Town only has purview over the surfaces. However, as described in the Bridges section, some of these structures have abutments that are wider than the superstructure.
Water Features	In some areas, water features, such as marshes and streams, create obstacles to widening the Bikeway. In at least two locations, small streams or rivers directly abut the Bikeway (2A-2B) and in other locations, marshlands would necessitate additional engineering considerations (2C).
Constrained Right of Way	The Bikeway runs adjacent to private property, open space parcels, and other property boundaries along much of the Arlington stretch. In many cases, fences (3A-3B), private parking lots (3C), or other structures mark the divide between private parcels and the MBTA right of way. In general, the paved path is situated approximately in the middle of the MBTA right of way, but in a few locations, the Bikeway runs closer to the edge of property lines.
Grading	Natural topography represents a barrier to widening in many locations. Several stretches of the Bikeway are marked by steep downward slopes beyond the edge of the paved width, likely due to the historical use as a railbed (4A-4B). In other locations, the land slopes steeply upward next to the Bikeway (4C).

Table 22: Photos of Barriers to Widening











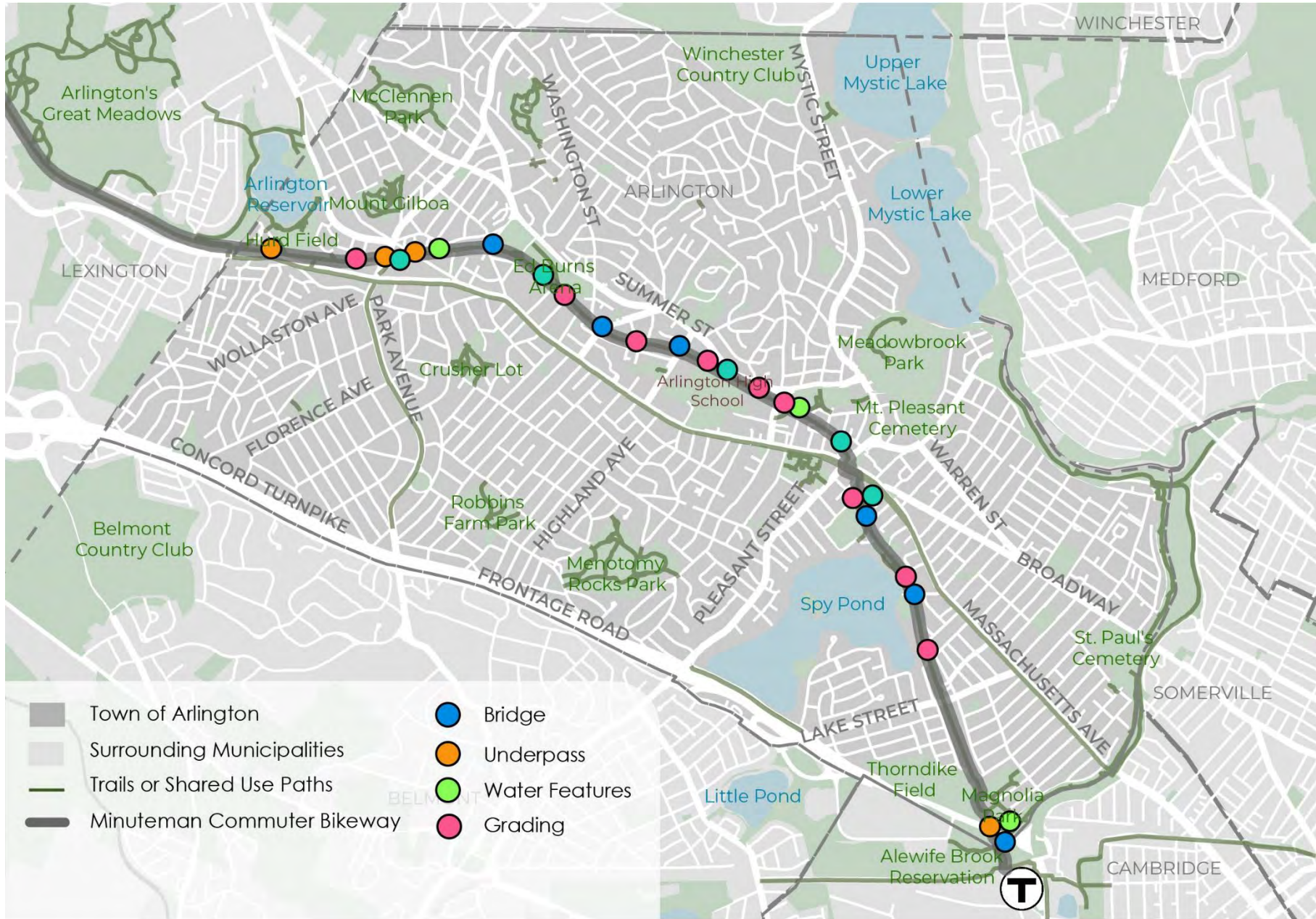
	1. Grade-Separated Crossings	2. Water Features	3. Constrained Right of Way	4. Grading
A				
B				
C				

Figure 11: Barriers to Widening

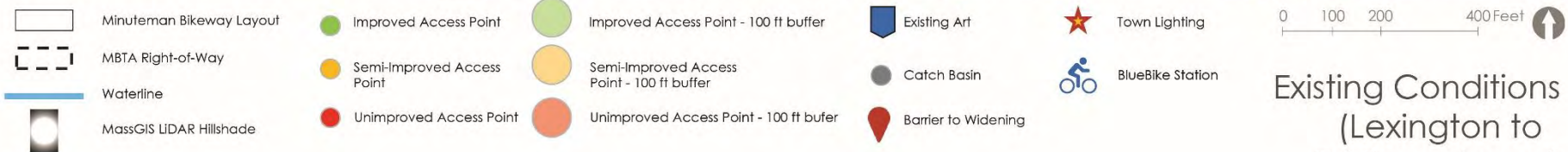


Barriers to Widening

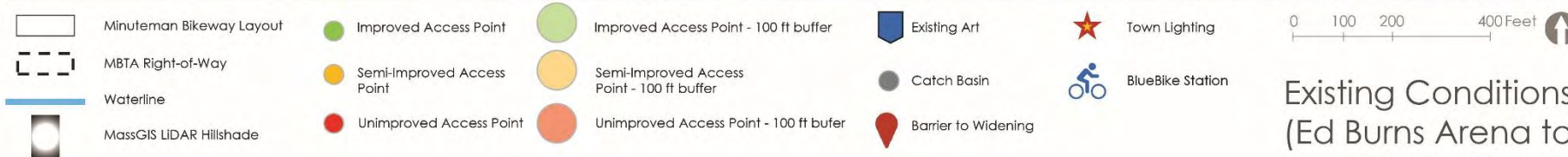
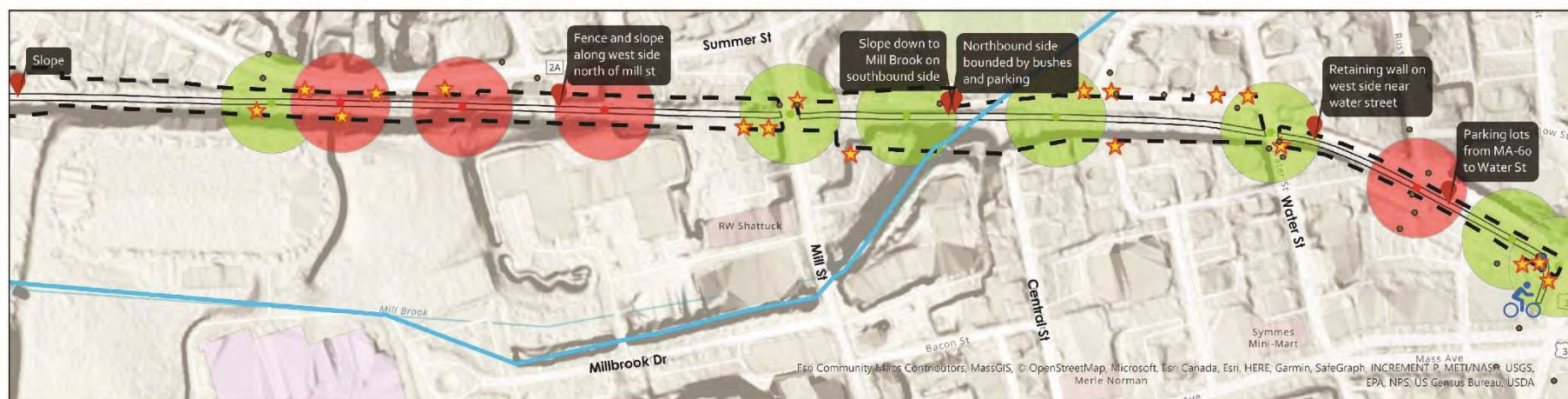
Appendix AA

Existing Conditions

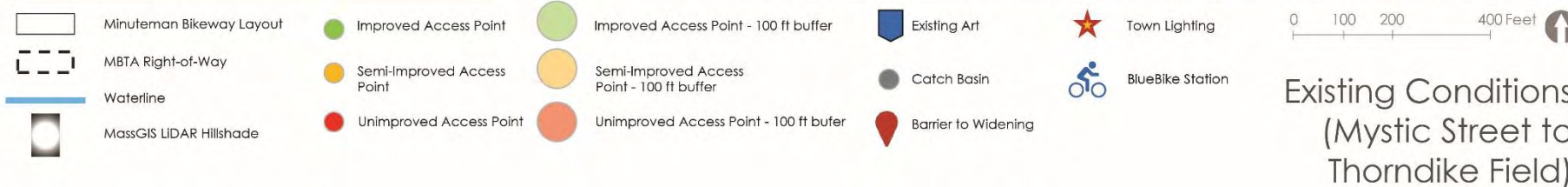
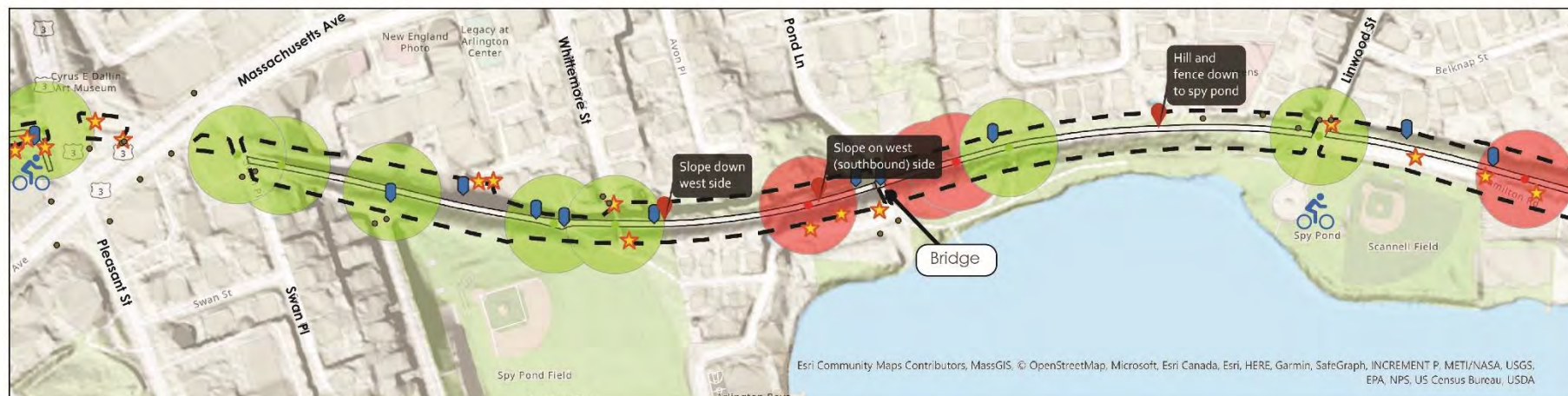
APPENDIX AA: EXISTING CONDITIONS



Existing Conditions
(Lexington to
Ed Burns Arena)



Existing Conditions
(Ed Burns Arena to
Mystic Street)



Existing Conditions (Mystic Street to Thorndike Field)



Existing Conditions (Thorndike Field to Cambridge)

Appendix AB

Bridge Over Alewife Brook

Assessment

APPENDIX AB: BRIDGE OVER ALEWIFE BROOK ASSESSMENT

General Notes

- Plans were obtained from MassDOT. The bridge was built around 1995 (per the plans). Since it was a prefabricated structure to be designed by the contractor, there are limited dimensions and details provided on the plans.
- The bridge was designed for 4.1 kpa (85 psf) per the plans. This is an acceptable design in line with current standards.
- The bridge is a prefabricated timber bridge: The Fairway model by Enwood Structures
- 2012 specifications for the Fairway model bridge by Enwood Structures were obtained through an internet search. Shop drawing could not be obtained. See **Appendix C** for specs.
- In general, the bridge is in satisfactory condition.
- Decking is in poor to fair condition. There are numerous checks and soft spots, creating a rough, uneven ride. The deck condition creates trip hazards. The underside of the decking is covered in mildew and water stains. The decking is nearing the end of its service life.
- The structural curb/girders, floorbeams, and stringers are all in satisfactory to good condition and suitable for reuse based on a visual inspection (although underside inspection was limited to the ends of the bridge because of the soft stream bed). Holes from attached decking may cause the stringers to be unusable to attach new decking.
- Railings are in fair condition. Railings are slightly out of plumb leaning outwards. They have a few soft spots. There are numerous missing nuts on the carriage bolts. Railings appear to be ADA compliant.
- The bridge pathway is 10' wide and the approach pavement is 11' wide. Current design standards would require the bridge pathway to equal the pavement + shoulders width.
- Settlement has caused bumps at the transitions from bridge to pavement.

Field Measured Dimensions:

- Railing posts spaced 8'-2"
- Railings are 2.75x3.875 and spaced at 8" +/- (4" gap), total height top of deck to top rail is 54".
- 5 rails each side
- Pipe handrails @ 8.5" and 34" +/- from top of deck
- Decking Boards are 6" nominal (5.5" wide). The depth could not be measured. The boards span full width.
- The curb beams are the main structural girders. They are 8.5"Wx36"D with a 15.5" curb reveal. The floor beams are supported by the curb beams with joist hangers and carriage bolts.
- Rakers to stabilize the curb beams spaced @ 14' +/-.
- 8.5"Wx10"D floor beams spaced @ 7'-9" +/- support the stringers
- 2 exterior stringers 3"Wx7"D
- 4 interior Stringers 5"Wx7"D
- Stringer spacing: 22" exterior spaces, 24" interior spaces

Recommendations:

- Replace the decking. The decking is near the end of its useful life. Structurally the decking is still ok and safe but provides a poor quality of ride and is a trip hazard. On average a deck made of pressure treated pine would be expected to last 15 to 20 years. This deck is approximately 25 years old.
- Since the floor beams and stringers have been shielded by the decking and kept relatively dry, they are still in fair to good condition and could be reused, but the decking appears to be fastened to the stringers using lag bolts or screws. The top side of the stringers may have too many holes once the decking is removed to reuse. The town should also anticipate replacing the stringers if they replace the decking or an alternative way to attach the decking (such as steel brackets).
- The railings are in fair condition and could be reused, but the timber is 25 years old and has soft areas. If funding is acquired to replace the deck and stringers, it would be a good idea to replace the railings too.
- If railings are not replaced, missing nuts, bolts and washers attaching to the posts should be installed.
- The approaches have settled and could be repaved to provide a smooth transition to the bridge.
- Overgrown vegetation around the bridge should be trimmed.
- The path is heavily used. If the bridge is rehabilitated an alternate crossing should be considered during construction, such as taking a portion of the alewife station access road.
- Although the bridge structural framing is in satisfactory condition for reuse, the expected life of the timber components would be another 15-25 years. If funding is available as part of a larger path project the town should evaluate bridge replacement. A new bridge would have an expected life of 75-100 years.

Appendix AC

Standard Specifications for the Fairway Model Pedestrian & Light Vehicular Bridge

APPENDIX AC: STANDARD SPECIFICATIONS FOR THE FAIRWAY MODEL PEDESTRIAN & LIGHT VEHICULAR BRIDGE

Standard Specifications Pedestrian & Light Vehicular Bridges THE FAIRWAY

Manufacturer: Bridge shall be designed and furnished by Enwood Structures, Raleigh, NC.

Bridge Design: Bridge design system shall be THE FAIRWAY.

Manufacture: Manufacture of the structural glued laminated wood components shall conform to the manufacturing requirements of the American Institute of Timber Construction Standards and Standard

Specifications for Glued Laminated Timber, AITC 117. Quality control shall be provided in accordance

with ANSI/AITC A190.1- latest edition and AITC inspection manual, AITC 200. AITC quality marks shall be used for identification. An AITC certificate of conformance shall be furnished upon request.

Manufacturer's and Fabricator's Certification: Bridge's manufacturer, and fabricator, shall be a member of, and hold full certification from, The American Institute of Timber Construction (AITC).

Manufacturer and Fabricator: The manufacturer and fabricator of the shelter's laminated wood components and the shelter's steel connectors shall be one in the same, to assure quality fit of all connections.

Quality Control: Quality Control shall be provided in accordance with ANSI/AITC A190.1-latest edition, American National Standard for Wood Products- Structural Glued Laminated Timber, and the American Institute of Timber Construction Inspection Manual AITC-200.

Lumber: Laminating lumber shall be kiln-dried, with 15% moisture content, Southern Yellow Pine graded to meet the requirements of Standard Specifications for Structural Glued Laminated Timber, AITC 117. Lumber combination shall be determined by the design requirements for each component and designated on the fabricator's shop drawings.

Appearance Grade: Laminated components shall be per AITC architectural appearance grade. Solid sawn lumber for decking shall be Southern Yellow Pine graded in accordance with SPIB.

Preservative treatment: The preservative treatment for glulam components shall consist of pressure treated laminated lumber (treated prior to gluing) with CCA (chromated copper arsenate) in accordance with AITC 109 Standard. Exterior stringers shall be .6 pcf or .3 pcf retention and all other glulam components shall be .3 pcf retention. Solid sawn decking shall be pressure treated in accordance with AITC 109 Standard

Adhesives: Adhesives shall be wet-use (waterproof) complying with ANSI/AITC A190.1- latest edition.

Hardware: All connecting steel and hardware shall be furnished by the manufacturer. Material shall be hot dipped galvanized.

Note: Anchor bolts/leveling plates are supplied by others.

Penetrating Sealer: All glulam materials to receive one factory applied coat of clear penetrating sealer.

Optional factory staining is available.

Foundations: The purchaser shall secure all necessary information about the site and soil conditions. Information as to the bridge support reactions, anchor bolt location and placement will be supplied by the

fabricator. Actual design and construction of the bridge supporting foundation (abutments, pier or footings) shall be the responsibility of the purchaser.

Enwood Structures can provide foundation designs as an option if all pertinent soil data is supplied.

Storage and Erection: The client or installer is responsible for protection of materials after arrival at destination. If materials are stored temporarily, they should be placed on blocks well off the ground and

separated with wood strips so air can circulate between members. Cover top and bottom with moisture

resistant paper. Use non-marring slings when handling the materials.




Shop Drawings: A complete set of shop drawings shall be furnished by the fabricator detailing all member sizes and connections.

Appendix AD

Existing Wayside and Trailhead Observations

APPENDIX AD: EXISTING WAYSIDE AND TRAILHEAD OBSERVATIONS

Table 1. Existing Wayside and Trailhead Observations

Location	Features	Observations	Points of Interaction	Points of Access	
			Wayside 	Trailhead 	Minor Access 
Lexington border	Benches	De-facto trailhead to Arlington. Major access point to Bikeway.		X	
Hurd Field	Parking, soccer fields, baseball fields, habitat garden, walking paths	Seasonal restrooms, connection to Arlington Reservoir. Major access point to Bikeway.		X	
Trader Joe's	Bike rack		X		
Walgreens	Bench		X		
Park Avenue	Stairway with bike rail	Grade Separated, Lack of maintenance.			X
Summer Street Sports Complex	Lighted baseball fields (Robillard and Buck Field), multi-purpose fields, basketball court, playground, benches, bike racks, bocce courts, picnic area	Direct connection off path. Seasonal restrooms at fields.		X	
Ryder Street	Parking	At-grade crossing. Ryder Street dead ends either side of path. Major access point to Bikeway.		X	
Burns Arena	Ice rink, bathrooms, snack bar, vending machines, parking.	Restrooms and food.		X	
Hill's Hill	Secondary trails	Minimal improvements.	X		

Brattle Street	Stairway, paved path to Washington St.				X
Mill Street		At-grade crossing. No improvements.			X
Buzzell Field Park	Two baseball fields (1 lighted), playground, basketball court.	Direct connection off path.		X	
Water Street		At-grade crossing. No improvements.			X
Uncle Sam Plaza/ Massachusetts Avenue	Benches, bike parking, historical info, landscaping, overhead banner sign	Direct connection off path. Overhead sign at Mystic Ave still relates to old alignment.		X	
Whittemore Park	Benches, bike racks, cultural heritage site and landscape design	Direct connection off Massachusetts Avenue WB bike lane.	X		
Swan Place	Overhead Banner Sign, bike rack, tire pump	Limited space.		X	
Spy Pond Park	Spy Pond field, playground, shore path, benches, tables, vehicle and bicycle parking.	Poor access or visual connection from path.		X	
Linwood Street	Blue Bike Station, kiosk, vehicle parking.			X	
Scannell Field	Portable toilets, baseball diamond.	Direct connection off path. Seasonal restrooms.	X		
Lake Street	Benches, bike rack, Little Free Library			X	
Varnum Street		At-grade crossing. No improvements			X
Thorndike Field/Magnolia Field (Parking Lot area)	Multi-use fields, vehicle parking lot, bike parking, benches, Blue Bike Station, community garden.	Direct connection off path.		X	
Thorndike Street	Bike repair station.	At-grade connection.			X
Thorndike Dog Park	dog park, benches, kiosk		X		

Locations immediately adjacent to each other are indicated by grey shading.

Appendix B

COMMUNITY INPUT

THIS PAGE LEFT INTENTIONALLY BLANK

MINUTEMAN COMMUTER BIKEWAY USER SURVEY RESULTS

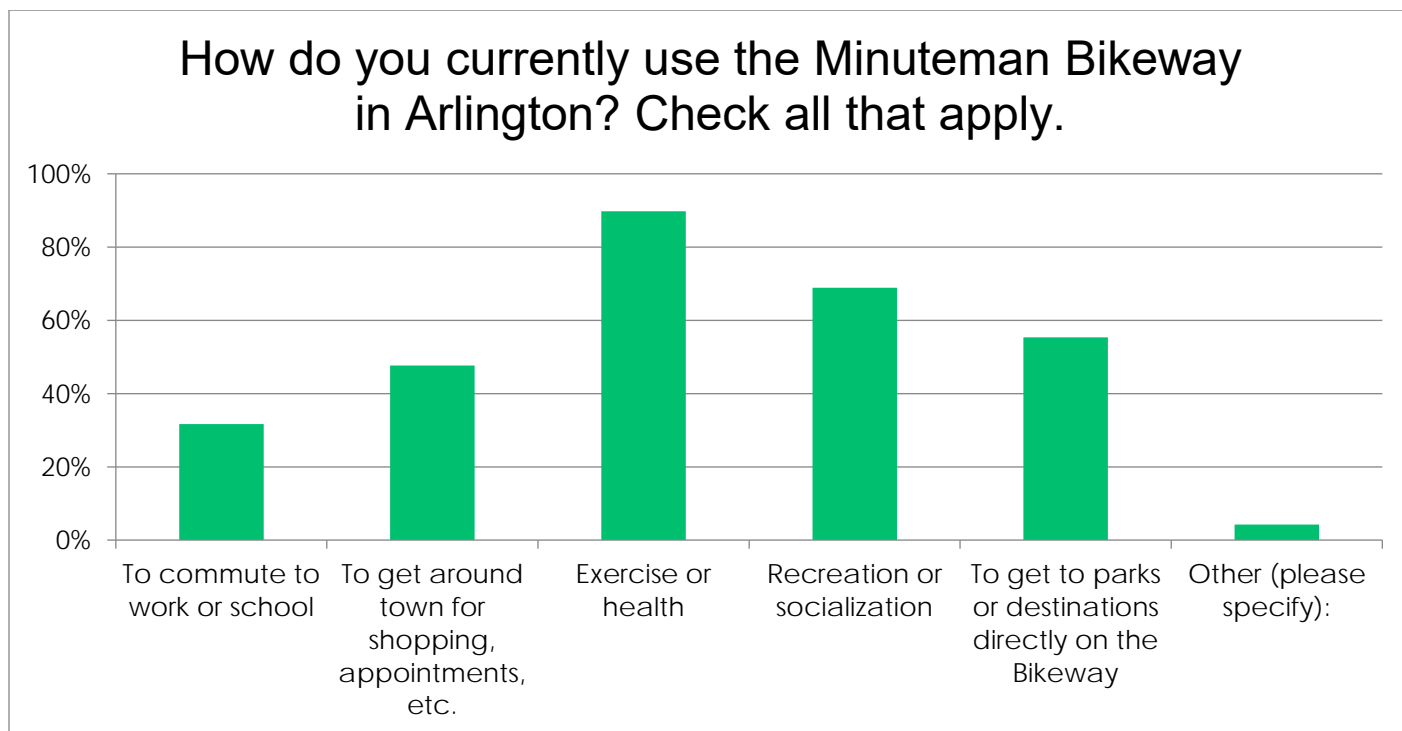
The survey was distributed online and as an intercept survey along the Bikeway in Fall 2021.

1. How do you currently use the Minuteman Bikeway in Arlington? Check all that apply.

Answer Choices

To commute to work or school
To get around town for shopping, appointments, etc.
Exercise or health
Recreation or socialization
To get to parks or destinations directly on the Bikeway
Other (please specify):

Answered	1686
Skipped	2



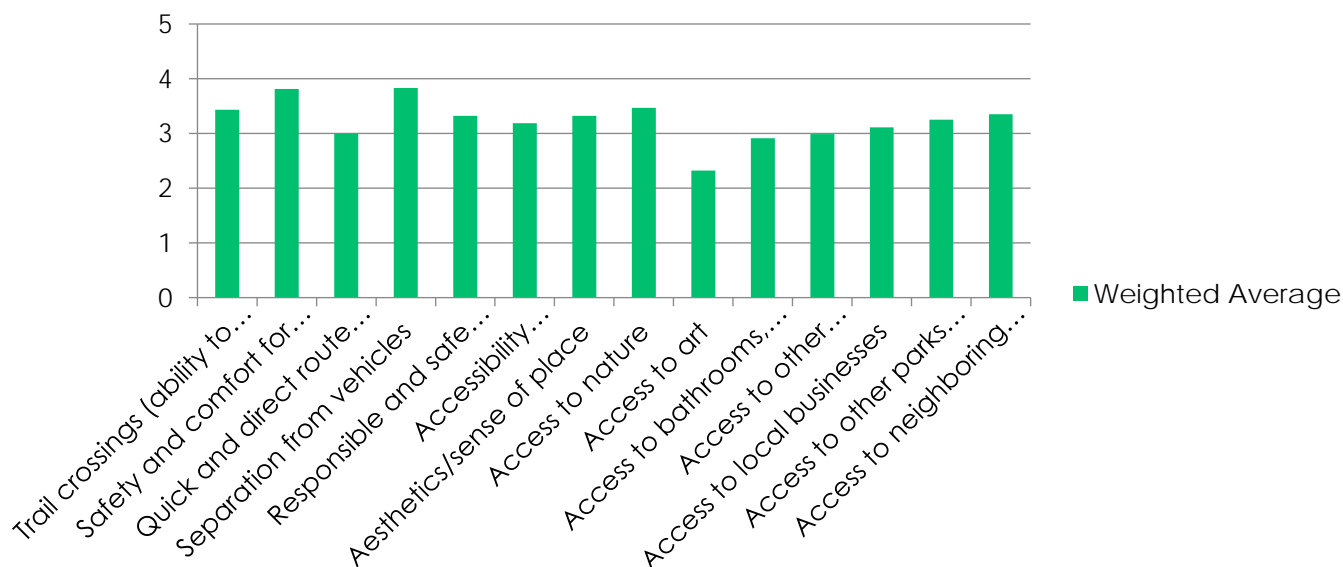
2. What aspects of the Minuteman Bikeway are most important to you? (Rank)

1 (Not important)	2	3(Important)	4	5(Very important)
-------------------	---	--------------	---	-------------------

Trail crossings (ability to exit/enter the path easily)
 Safety and comfort for all users
 Quick and direct route to destinations
 Separation from vehicles
 Responsible and safe use of electric bikes and scooters
 Accessibility (ADA/Universal Design)
 Aesthetics/sense of place
 Access to nature
 Access to art
 Access to bathrooms, water fountains, and other facilities
 Access to other transportation facilities (bus, bikeshare stations, trails/paths)
 Access to local businesses
 Access to other parks and recreational opportunities
 Access to neighboring cities/towns (Lexington, Cambridge, Somerville, etc.)
 Other (please specify):

Answered 1674
Skipped 14

What aspects of the Minuteman Bikeway are most important to you?



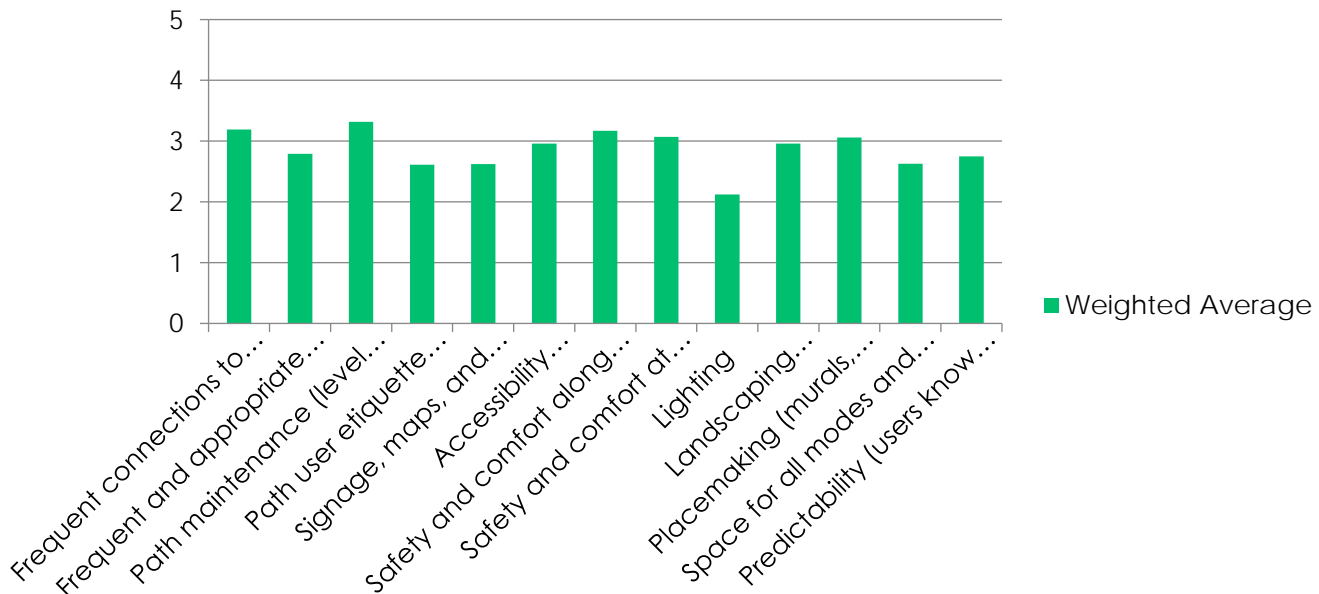
3. How well does the Minuteman Bikeway meet the following criteria? (Rank)

1 (Very poor) 2 3(Good) 4 5(Excellent)

Frequent connections to neighborhood streets that are easy to navigate
 Frequent and appropriate amenities (benches, parking, places to pause or rest, etc.)
 Path maintenance (level pavement, free of puddles and potholes, leaf/snow removal, etc.)
 Path user etiquette (passing, no speeding, yielding, etc.)
 Signage, maps, and wayfinding to the path and nearby destinations
 Accessibility (ADA/universal design)
 Safety and comfort along the path
 Safety and comfort at street crossings
 Lighting
 Landscaping maintenance (cutting back weeds/shrubs, new plantings, etc.)
 Placemaking (murals, public art, etc.)
 Space for all modes and users to operate comfortably
 Predictability (users know what is expected of them and others)
 Other (please specify):

Answered **1675**
Skipped **13**

How well does the Minuteman Bikeway meet the following criteria?



4. Please indicate any additional comments, concerns, or recommendations for the Bikeway in Arlington. Where possible, please provide specific locations:

Answered 756
Skipped 932

5. What is your home zip code?

Answered 1594
Skipped 94

6. Please indicate your age:

Answer Choices

Under 18

18-24

25-34

35-44

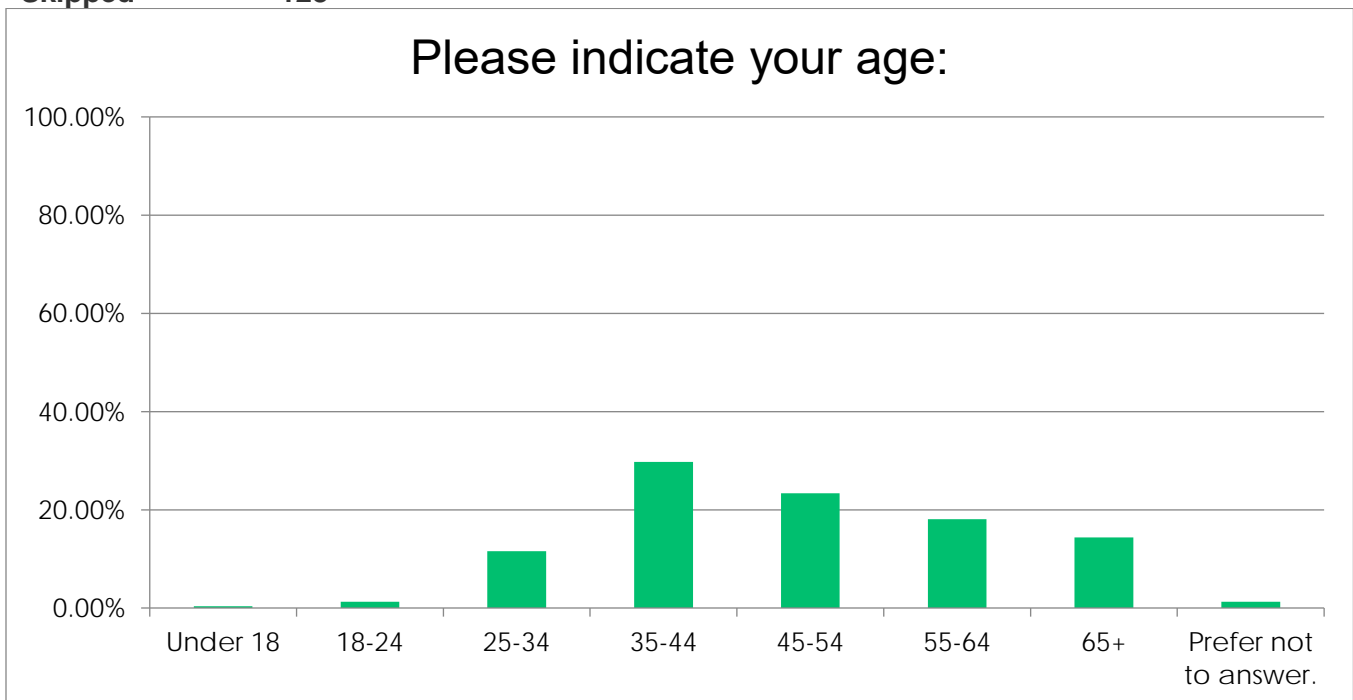
45-54

55-64

65+

Prefer not to answer.

Answered 1560
Skipped 128



7. How would you describe your gender identity?

Answer Choices

Female

Male

Non-binary/Non-conforming

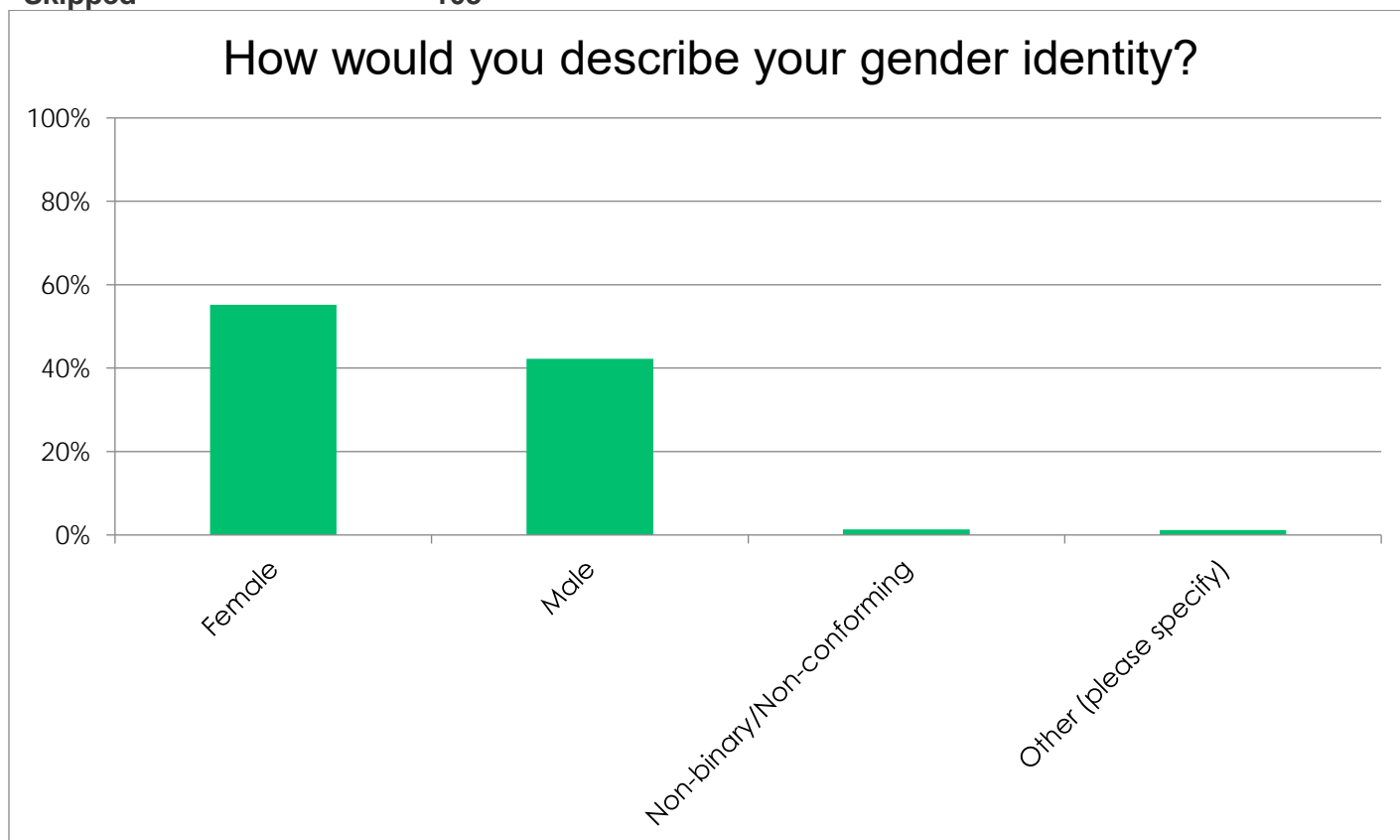
Other (please specify)

Answered

1585

Skipped

103



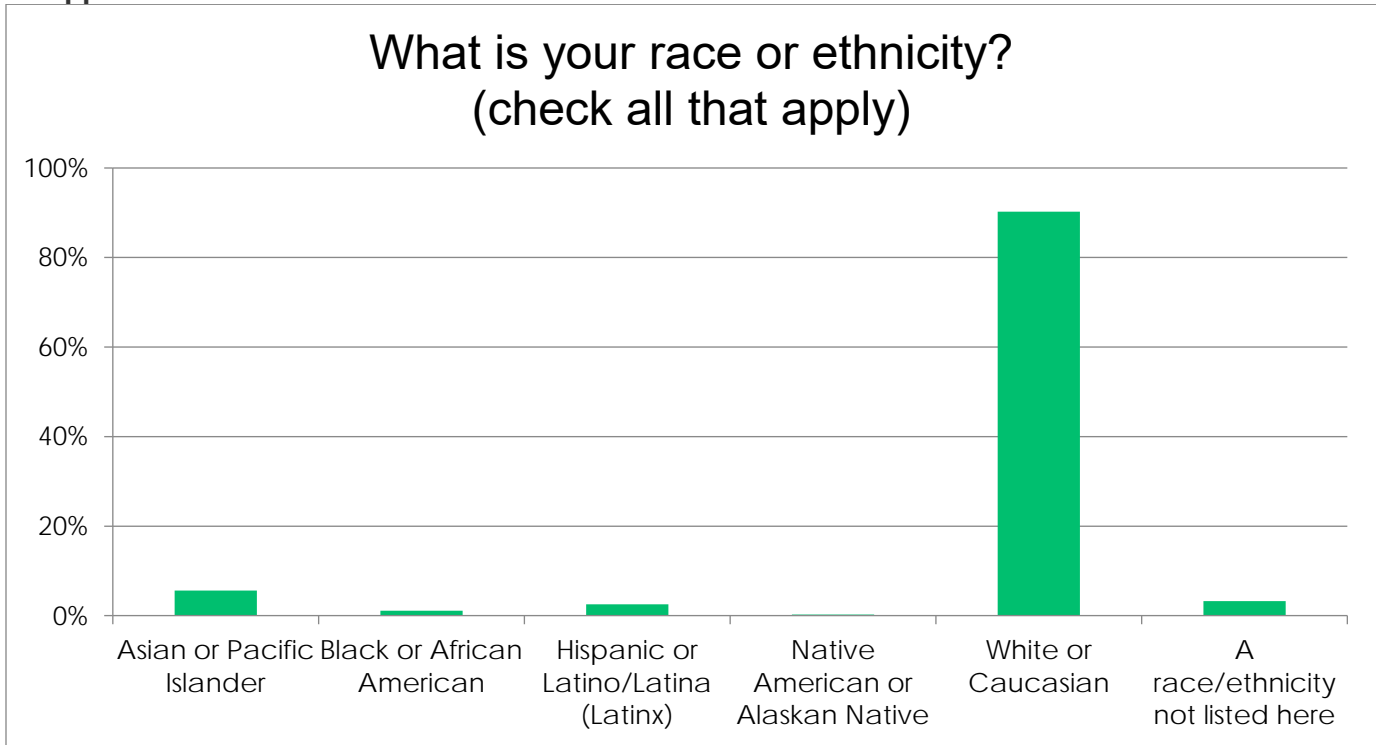
8. What is your race or ethnicity? (check all that apply)

Answer Choices

Asian or Pacific Islander
Black or African American
Hispanic or Latino/Latina (Latinx)
Native American or Alaskan Native
Native
White or Caucasian
A race/ethnicity not listed here

Answered 1514

Skipped 174



9. How do you typically travel on the bikeway?

Answer Choices

I walk or run

I bike

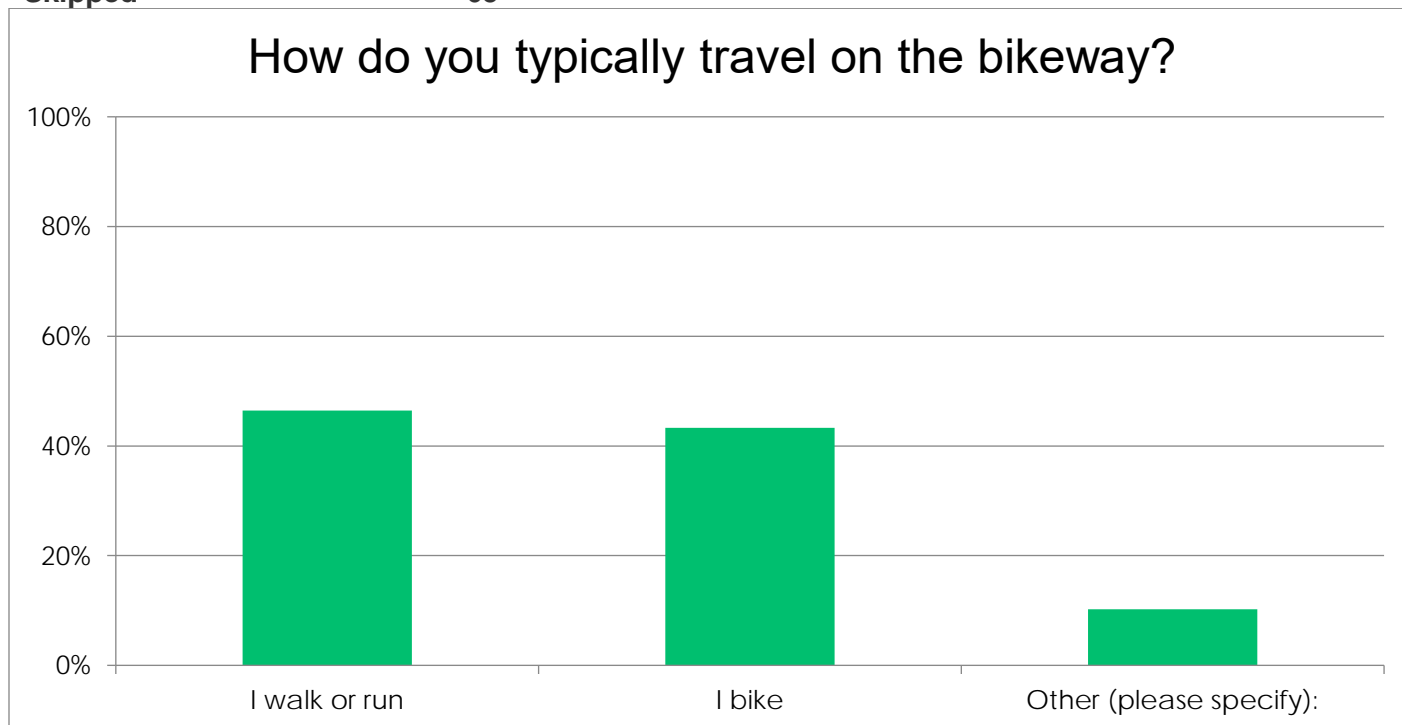
Other (please specify):

Answered

1623

Skipped

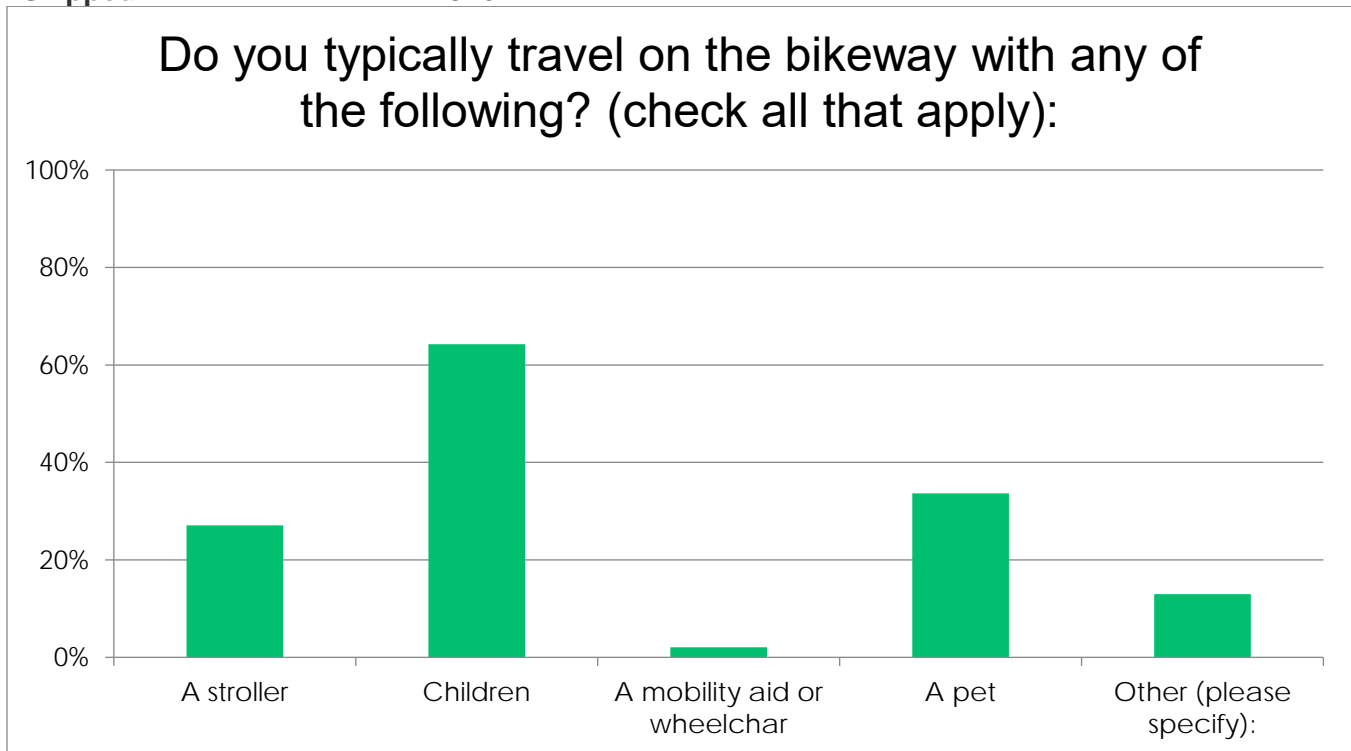
65



10. Do you typically travel on the bikeway with any of the following? (check all that apply):

- A stroller
- Children
- A mobility aid or wheelchar
- A pet
- Other (please specify):

Answered 772
Skipped 916

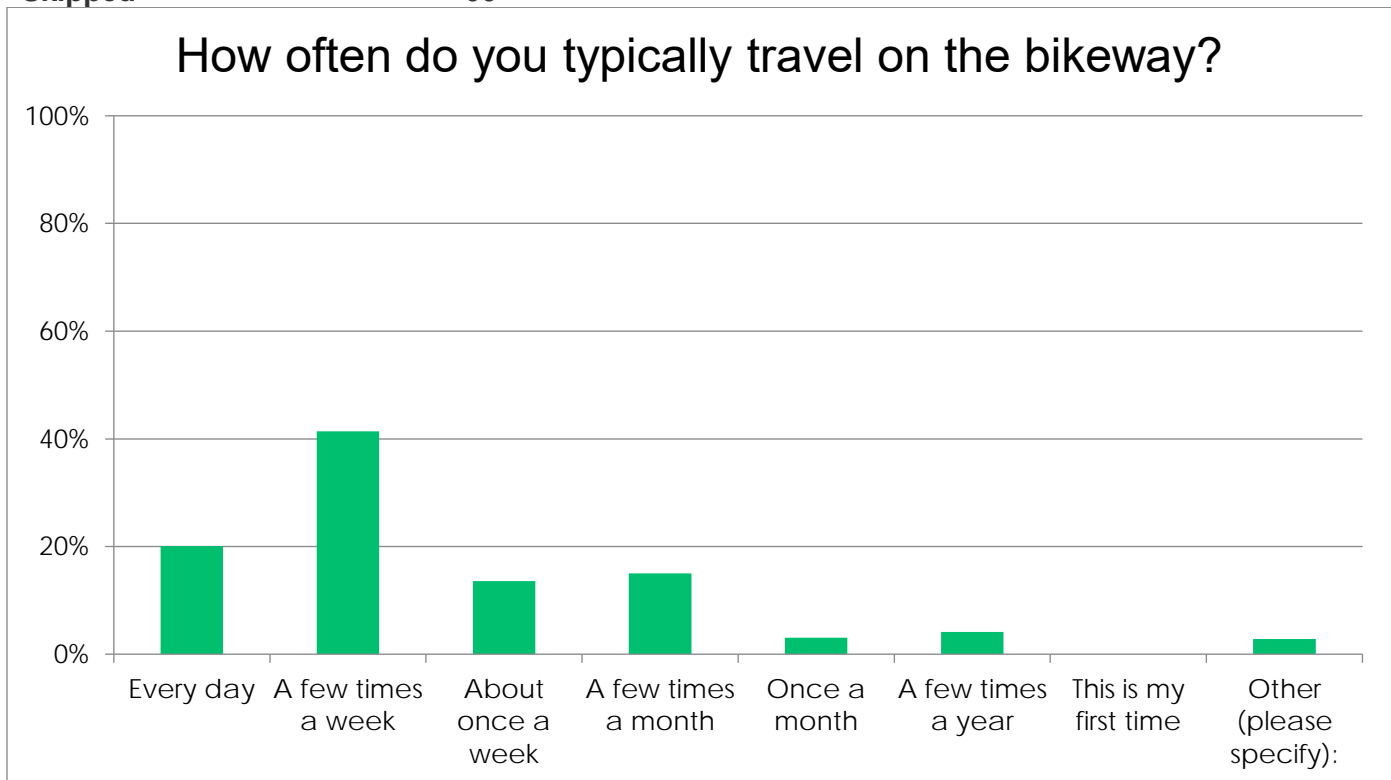


11. How often do you typically travel on the bikeway?

Answer Choices

- Every day
- A few times a week
- About once a week
- A few times a month
- Once a month
- A few times a year
- This is my first time
- Other (please specify):

Answered 1622
Skipped 66



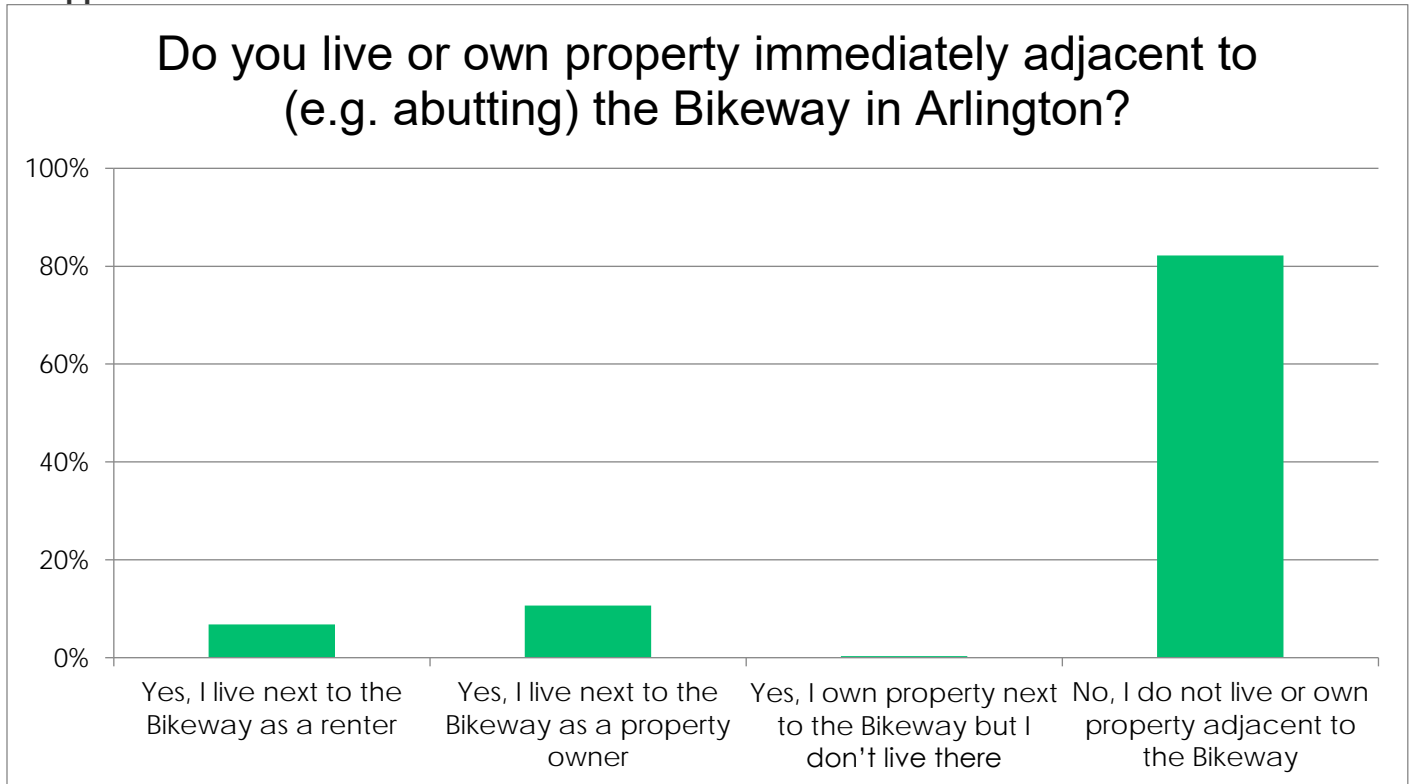
12. Do you live or own property immediately adjacent to (e.g. abutting) the Bikeway in Arlington?

Answer Choices

- Yes, I live next to the Bikeway as a renter
- Yes, I live next to the Bikeway as a property owner
- Yes, I own property next to the Bikeway but I don't live there
- No, I do not live or own property adjacent to the Bikeway

Answered 1612

Skipped 76



MINUTEMAN COMMUTER BIKEWAY MEETING BREAKOUT SESSION NOTES

During a virtual public meeting in November 2021, attendees were split into breakout groups and asked a series of questions:

1. What do you enjoy about the Minuteman?
2. What stands in the way of you enjoying the Minuteman or using it more frequently?
3. What does the perfect Minuteman Bikeway look and feel like to you?

Answers were recorded and shared using an online tool called Conceptboard. The recorded notes from each breakout group are included in the following images. Note, not all groups addressed every question.

ARLINGTON MINUTEMAN BIKEWAY PROJECT

Breakout Groups (20 min)



1. Brief Introductions

- When was the last time you were on the Minuteman?

Conor Semler
September

Bob White
Week and a half
ago

Adam Auster
Yesterday evening around
dusk

Joe Sasso
Monday before moving
to Tampa for winter

Petru Sofia
Yesterday on way to
school

Robin Bergman
Few weeks ago
(walking)

Andrea
abutter, on path
most days

use sticky notes
to record the
group's
conversation

2. What do you enjoy about the Minuteman?

Art along the path
(crochet items)

"Green tunnel" though
neighborhoods; peaceful
experience

Ability to access
things
(fields/sports);
let kids get places
in town

Opportunity to
exercise and work
out away from cars

Being able to have a
conversation side-by-
side-ish. Comfortable
place to ride; relaxed
where there are no
crossings

Enjoy nature around me; don't
ruin trees along route with
path changes.
Would be nice to have
deliberate plantings along the
path

Really like that it gets
places without using Mass
Ave. Path provides access
to Lexington, Bedford,
Arlington Heights without
riding on Mass Ave

Agree. Mass Ave is getting
better, but it's a really bad
place to ride a bike. Path is too
busy in the summer.

3. What stands in the way of you enjoying the Minuteman or using it more frequently?

Crowding and lack of bike parking at
certain destinations.

Arlington High School access from the
path doesn't have enough parking, so
have to use Mass Ave access.

It would be nice if there were
more things like coffee shops
and pop-up vendors along the
path. Mass Ave has
businesses, but it would be
nice to access right along the
path

Crowding. Sometimes it's nice
to be away from crowds while
biking.

Home location is up a major
hill which makes it hard to
bike from the path.

Worry about times when
there's high traffic. Feels
dangerous.

Bike etiquette; signs could help
remind bikers to call out when
passing. Bikers passing walkers
can startle.

Walking etiquette too. Walkers
should be to the right.

4. What does the perfect Minuteman Bikeway look and feel like to you?

- Feel free to think outside the box!

ARLINGTON MINUTEMAN BIKEWAY PROJECT

Breakout Groups (20 min)



1. Brief Introductions

- When was the last time you were on the Minuteman?



Daily users that log dozens or hundreds of miles on the Bikeway each year

Ride with their kids

use sticky notes to record the group's conversation

2. What do you enjoy about the Minuteman?

Car-free bike path
Vital civic commons – great variety of people to interact with

Runs through spine of the town -- you can basically get everywhere without a car once you know where you are
Place where kids could ride before they learn how to ride with car traffic

Gets you to the city, and also gets you into the country -- provides car-free access to nice areas

Lots of love for the Bikeway, the reason people have moved to Arlington

Would not like to see it lit, like the dark night on the backside and privacy

3. What stands in the way of you enjoying the Minuteman or using it more frequently?

No good connections on the south side of the Bikeway between Jason St and Brattle St
Should be more regular access, like every 3 blocks -- access for both sides of the Bikeway

People don't always know how to operate for conditions; forget to look for other people when they are on it -- endangers them or other people
People don't know how to behave

Speed of travelers, especially electrified scooters, one wheels, etc. - not so concerned about pedal-assist bikes

Some of the access points are ad hoc, can be hard to get on and off
Can't get off the Bikeway when you get past the High School until Brattle -- a lot of time out of the way

Access points don't always make sense -- are not safe -- would not send your young kid through a parking lot (Gold's Gym)
There might be some simple fixes to this

4. What does the perfect Minuteman Bikeway look and feel like to you?

- Feel free to think outside the box!

Reflectors in roadway along the path to help people navigate, if you widen it
Don't want it to become more like a park where people hop on and off a lot

Breakout Groups (20 min)



1. Brief Introductions

- When was the last time you were on the Minuteman?

use sticky notes to record the group's conversation

2. What do you enjoy about the Minuteman?



Bruce Freeman as an example of landscaping, invasive removal, look and feel, Bikeway feels utilitarian

some portions of BF don't have enough activity and interest

3. What stands in the way of you enjoying the Minuteman or using it more frequently?



4. What does the perfect Minuteman Bikeway look and feel like to you?

- Feel free to think outside the box!



Breakout Groups (20 min)



1. Brief Introductions

- When was the last time you were on the Minuteman?

Arlington Heights

Bike Commuting

Recreational Riding

School Pick-up

former abutter

use sticky notes to record the group's conversation

2. What do you enjoy about the Minuteman?

Quieter than Mass Ave. Can have conversations. Can get across town relatively quickly and at own pace. If you are slower, it can lead to conflicts with vehicles. During commuting hours, traffic is mostly directional.

It's there! (user since the beginning) Recreational riding, commuting pre-pandemic. Amenity for the town/region. No issues with variety of users - that's what it's there for as a multi-use path.

Natural beauty. Access to Alewife. Grade separation. Fewer intersections than Mass Ave.

Feel comfortable walking/riding bike at most times of day

3. What stands in the way of you enjoying the Minuteman or using it more frequently?

When riding recreationally, riding for exercise. Heavy use on nice days (especially warm days in summer). When riding for exercise, feel safer on Mass Ave.

Doesn't always go where I want to go.

Variety of uses

Mill Street intersection is problematic

Lack of lighting at night. Blue bikes + broken lights --> can't keep riding. Modern lighting doesn't seem to affect abutters as much (ex/ Somerville community path).

Very busy at times

4. What does the perfect Minuteman Bikeway look and feel like to you?

- Feel free to think outside the box!

Used to roller blade + stroller. Commuter. Using it for shopping/errands with E-bike. Better connections + signage would improve the Bikeway for the community. Should be opportunities for local businesses to make connections with people on the Bikeway.

Brattle St access. Washington St is a private way with lots of potholes. Paved entrance to path would be safer.

Desire paths make bikeway wider than it is. Would be nice to have wider lanes, space for walking dogs, riding bikes, etc. Expect to be some places where you have to slow down to go over a bridge/through an intersection.

Segregating pedestrian and bicycle traffic (ex/ Venice Beach)

Other

Could emulate Bootleg connection in East Lexington from MA France on Mass Ave to the bikeway with signboard.

Some college campuses let people walk through grass and then pave trails based on desire paths

There are connections

Lake Street chicane has made a huge difference

In high congestion areas (Lake St, approaches to intersections) like when there is extra space for overtaking slower users. Better than Water/Mill St intersections.

Breakout Groups (20 min)



1. Brief Introductions

- When was the last time you were on the Minuteman?

Live near East Arlington
Wants to replace invasive
plants and replace with
native

Uses path several times a
week for recreation and
physical activity

Uses path daily; lives a
block away
Walks dog

East Arlington resident; grew
up in the area

Rides bike, walks dog, and
uses the path several times
per week

East Arlington resident;
used the path this morning
Walking/biking user weekly
Uses bike lanes on Mass Ave

2. What do you enjoy about the Minuteman?

Efficient and safe way to travel
(bike)
Avoid traffic and vehicles

Accessibility, neighborhood
walkability
Variety - characteristics along
different segments
Want to maintain distinction
between segments
Native plants

Accessible, connected
Mix of people using
the path
Great public space

Enjoys nature
Connects to destinations
No stress of dealing with
traffic
Taught her child to ride
on the path; there aren't
many other safe options

3. What stands in the way of you enjoying the Minuteman or using it more frequently?

Too many
invasive plants

Inconsiderate users
- Slow moving users not
staying to the right
- Wandering dogs

More native plants, trees;
create a 'green ribbon'
Speeding cyclists (Uncle Sam
plaza); turning too quickly
(Water Street)

Consider warning signs
Benches

Speeding, inconsiderate
users

Consider building/designing
parallel bike facilities on other
roads

4. What does the perfect Minuteman Bikeway look and feel like to you?

- Feel free to think outside the box!

Aesthetic improvements
Enhanced connectivity - connect
to destinations, such as
Arlington Heights

More trees; remove
knotweed and poison ivy
near water authority building
near the high school

Pollinator pathway
(milkweed)

Education signs for
speeders
Added shoulders for
users stopping
Pollinators, native species

Consider speed limits
(signs or striping)

Create a destination

ARLINGTON MINUTEMAN BIKEWAY PROJECT

Breakout Groups (20 min)



1. Brief Introductions

- When was the last time you were on the Minuteman?

A few days ago when I used a blue bike to bike the path near Linwood st. I live in East Arlington near the Capitol Theatre.

use sticky notes to record the group's conversation

2. What do you enjoy about the Minuteman?

Large sections of path where I don't have to worry about upcoming traffic crossing my path... Helps with exercise. Wonderful views (spy pond, great meadows, Lexington commons, etc) Seeing fellow townsfolk out and about (good energy) The art.

Fall foliage, nature. Birds (cardinals sometimes between Lake St and Thorelike field). Connects parks like Spy Pond park and Thorelike field. Connects to Alewife for going places. Connects to Arlington center without walking along Mass Ave. Can take the Belmont path from Alewife biking or walking. Also can get to Discovery Park, Little river. Connects to phyragmies marsh and Alewife brook trail.

3. What stands in the way of you enjoying the Minuteman or using it more frequently?

It's too busy sometimes, especially weekends. Doesn't feel safe then.

If at night, I don't mind using a headlamp but with the news of the coyotes in the nearby woods, I don't want to take the chance so I run along Mass Ave at night and then pathway during day time.

Long traffic signal waiting time at Swan Place.

Feasibility of a connector from the bikeway to the Bus depot in the Heights? Years ago, we wondered if there could be a bridge over the Brook there, and the area has only increased in activity since then.

There is no obvious indicator at the Swan Place traffic light that the system "sees" you and will change to green soon.

A. Somewhat crowded especially summer weekends. I avoid walking due to safety concerns. I go biking at Barn Sunday to avoid bike traffic in summer for example.

B. There is no direct way onto path from Blue bike station in E. Arlington at Grafton and Mass ave. I go down Chris Rd then Lake st go a short way on Lake st to path.

C. Used to have a small bike rack at Lake st. intersection. Since traffic signal work, no bike rack. There used to be a sign "Shops 1/4 mile" down Lake st at Lake st intersection but I think the construction took it down.

Need to have connection to E. Arlington shops, restaurants, stores.

D. Overgrown bushes-- maintenance near intersection of Linwood st next to spy pond park is lacking. Just this week there were several bikes passing me and the overgrown tree branches reduce safety. Everyone agrees it is narrow there but if you just maintained the tree and bushes it would reduce visibility problems etc.

4. What does the perfect Minuteman Bikeway look and feel like to you?

- Feel free to think outside the box!

Make the path into a greenway or a linear park more than just a path.

A bikeway with simple connections, reduced trail crossings, separate facilities for pedestrians and bicycles, and with no gaps.

Improved user awareness and notification especially during changes of direction or sudden acceleration or deceleration (I can navigate around people as long as I have a sense of a person's direction and have space to negotiate it). This may be accomplished via shared guidance and signage such as the sign near Magnolia park that says stop to the right unless passing. Signage to indicate local business where someone can get food or water during long trips (such as the sign at Lake street about the cinema and the Ma France sign in Lexington). Wider path (I know there isn't a lot of space but it would help). Less plants around blind curves and access points. I did like the thought of structures like the new one on Lake street as people do have to stop occasionally but not be in the way. Signage painted on the ground showing the town and the mile marker (this is similar to the Cape Cod rail trail).

Thank you for the opportunity to hear more about the Bikeway upgrade project. Near the end, I realized I had a further thought. I tried to input in the chat to send to a facilitator, but it had evidently been disabled. I wanted to share the thought now, and also ask if we might speak by phone. My thought regarding etiquette and safety. I'm aware that in some parts of the country, bike and walking traffic is organized differently than on our path. The expectation is that bicyclists follow the normal street traffic rules, of biking on the right lane. Walkers, in contrast, walk against bike traffic, as is advised when walking on roadways lacking sidewalks. It's possible that this practice might make walkers more aware of oncoming bikers and also make bikers more attentive to walkers. My understanding is that people naturally alert to faces, and tend to give a wider berth when eye contact is possible. When coming up from behind. My experience is that bikers tend to clip it close when passing from behind. Just a thought.

Picnic tables, benches, wayfinding, map of whole minuteman trail at Alewife or at arlington/cambridge line, maps to give out, pin up board/wood overhang station, flowers/bushes near benches at Lake St. Easy to find water/ fountains, water at bike store in arlington heights is expensive. There is water fountain at spy pond park. But you would never know it. Better connection to blue bike stations (Grafton St and Mass ave., Broadway and Grafton st., not directly on trail). Wayfinding to trail. Easy access to E. Arlington shops and stores and bike path. Lake Street is not good for biking and that is the main way to trail in E. Arlington. Festival on Bike Path -- like Feast of the East in east arlington with booths, food, T-shirts. Maybe 3 stations/tables one at Arlington Height. One at Arlington center and one at Thorelike Field. Give out info, maps, bird watching information, litter pickup. Blue bike information table. Friends of Spy pond. If you punch your ticket at all 3 stations you get a free T-shirt. Bird and wildlife identification info like the DCR board near Boston Ave/Mystic Valley intersection along Mystic River showing watershed, maps of DCR properties. Perhaps maps of Arlington parks and fields included likewise.

Motorized vehicles are prohibited from the bikeway for safety and usability of the path, and motorized bicycles and scooters contribute to the bikeway being unsafe and unusable by current groups of people. They often travel at rates of speed that is higher than most bicycles, making them harder to maneuver over and stop. I do not feel comfortable bringing our children on the bikeway because of the risk of getting hit by a heavy, fast electric vehicle. The presence of electric vehicles is discouraging the use of the trail by core groups it was intended to serve.

While cleaning up the bike path and embankment, the project should involve supervised volunteers, clearing invasive plants from along the path and embankment because they invade all the surrounding areas. The project should then replace where these plants presently exist with native plants. Seed packets could be provided to introduce proper growth along the bike path, replacing the many invasive species that are removed.

Although not directly related to safety, this should be a vital adjunct to this project, important for preservation of native growth throughout Arlington's parks and residents' own yards.

I happened upon the aftermath of the fatal bike accident back in 2019. I don't know exactly what happened but that experience makes want to emphasize safety as the top goal. The path is near many schools, an assisted living facility, and other stakeholders. I would like us to make sure everyone gets a chance to use the path but in the safest way possible. Be that through online communications, signage, sharing of rules/guidance or other ways. Thanks for your consideration.

If people feel like the Bikeway is the only (or best) safe place to bike or walk, we need to improve Mass Ave and make MORE places better to bike and walk so everyone doesn't feel like they have to funnel to the Bikeway. Lean on the Connect Arlington plan for that, as I think there could be a lot of synergies between the bigger plan and this plan to push for better biking and walking everywhere.

- Widening the Bikeway is definitely needed
- Puffblows are needed so people don't stop in the middle of the path
- Services need to be improved
- Signage throughout to provide guidance on path etiquette and right of way priority, sharing the path
- Better visibility and maintenance of the existing pavement
- Light to more recently built bike paths as examples (the Minuteman Bikeway is still very "basic")
- Better communication to path users
- Pump up the maintenance and attention to the Bikeway
- Peer pressure from path users to get others to share it
- Education in tandem with physical improvements
- Limitations on usage (such as time-limited usage for certain methods) to a good idea.

I want to make sure you know the severity of the drainage problem between Lake and Linwood, especially next to Hamilton Road. It's plainly dangerous and unacceptable in the winter months. I am a four season bicyclist, so are many folks in the neighborhood. Furthermore, many kids and their parents and grandparents walk to nearby in this section. See photos attached. You can see a family pet a shih tzu trying to get by one of these enormous puddles, which last for days. You can imagine what happens when cyclists, pedestrians, runners, all ages and abilities, all try to squeeze onto a very narrow slice of the path at one time. It isn't a passage exists at all. It often doesn't. Talk about "Safe Routes to School" ... Nonetheless, there is only one catch basin in the area, at roadkill effectiveness, in fact, it protrudes above ground level. And when there are snowbanks, even modest ones, the water and ice collect on the path, creating enormous puddles which become sheets of ice. The DPW has known of this problem for years and hasn't fixed it, saying essentially "It's hard to fix." We need to keep the path clear and as safe as possible. I'm not looking forward to another winter of this. I hope you'll take this into account in your planning.

MINUTEMAN COMMUTER BIKEWAY

MEETING POLL RESULTS

During a virtual public meeting in March 2022, attendees were asked a series of questions related to placemaking.

1. What amenities that help you Access and get Oriented along the Bikeway are important to you?

	Responses	Percent
Informational or regulatory signs or kiosks with maps, rules, and policies	20	80%
Vehicular Parking	2	8%
Bicycle Parking	13	52%
Services, such as bike rental or repair stations	17	68%

2. Which amenities that help you Rest and Regroup on a ride or walk are important to you?

	Responses	Percent
Seating	16	48%
Views and vistas	24	73%
Lanscaping and plantings	20	61%
Pull offs for pausing out of the way of path traffic	24	73%

3. Which amenities that help you Immerse yourself on a visit to the Bikeway are important to you?

	Responses	Percent
Public art	17	52%
Cultural, historical, or educational exhibits	20	61%
Natural areas	32	97%
Social interaction	10	31%

4. Which amenities that help you Recreate (for physical activity or otherwise) on the Bikeway are important to you?

	Responses	Percent
Multi-use fields	11	33%
Sports and exercise equipment	3	9%
Playgrounds	11	33%
Secondary Path	29	88%

5. Out of these categories, which ones are most important to you?

	Responses	Percent
Access and orient	18	53%
Rest and regroup	13	38%
Immerse	22	64%
Recreate	11	32%

6.What do you wish to experience when you visit the Bikeway?

	Responses	Percent
Natural landscapes that are interesting and relaxing	30	88%
Playful signage, art installations, and space for kids and adults	12	36%
Clean, efficient, and safe thoroughfare	28	82%
Cultural or historic stories of Arlington and its people	16	47%

7.What kind of creature comforts would you like to see more of along the Bikeway?

	Responses	Percent
Water fountains	15	44%
Restrooms	22	65%
Seating and gathering places	17	50%
Directions to nearby shops and food establishments	14	41%
Shade	10	30%
Enjoyable landscape views	23	68%

8.Are there any amenities or experiences we have not mentioned that you would like to see along the Bikeway?

- Thanks, you captured. Wish list— bike speed lane. Maybe railing for accessible walking? Not sure...
- I have come to realize that modes must be separated .
- I would like to see everything add up to making the experience of the trail more expressive of it being a different environment from the street.
- Free Beer!!
- Would be nice to leave some snow for x-country skiing instead of plowing it all
- Priority crossing at street: speed hump & flashing light automatically triggered for cross traffic when bike/ped detected approaching crossing. And +1 for dedicated bike/ped lanes on path
- sections that can be adopted by residents to grow plants/flowers/herbs
- more stop lights at streets with many cars. It would be great to have technology that nade cars coming known to bikers
- Have all fences removed, increased indigenous plant species
- bike racks
- Public Art (ysr you mentioned it and even showed a pic of Andy Goldworthy - is he available to do a low-cost project, please?) But seriously, think Banksy meets Land Art for our brains and eyes...
- separation of uses -- fast bikers vs. walkers
- better pruning of invasives along the path-- esp. Japanese Knotweed
- I do not think that there is anything that is not covered in one way or anoter.
- Improving separation between bikes and perdestrians so the bikes can safely go fast, and the pedestrians can walk slowly without interfering wtih each other
- A dirt path or stone dust path for walking
- Wider path, lighting
- Connections to business districts—with bike parking.
- seperate bike and pedestrian paths
- Provide directions to other paths, e.g., Somerville path, Vine Brook Path, Reformatory trail etc.
- Happy with it as it is

- 1. Lighting!! feels unsafe when dark, also difficult to use in general when you can't see. 2. Signalized and/or improved grade crossing (& fix traffic signal timing at Lake St to match Lake/Brooks)
- Arborist input on trimming and side maintenance to reduce “impingements”.
- Safe crosswalk from Webcowet neighborhood to the Mystic lakes.
- raised crossings at all intersections
- safe and legible connections for all cyclists ages 8-80 to access the bike path to/from Arlington
- good connections to transit. Wayfinding from the neighborhoods/commercial districts TO the bikeway.
- Opportunities to enjoy flora and fauna - wildlife as well as plants, water features, all with some calm and quiet.
- Separate sections for walkers & bikers (if feasible)